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SEPTEMBER 1927

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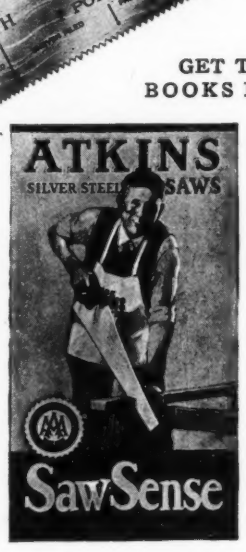

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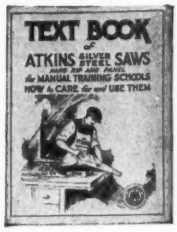

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THE INDUSTRIAL ARTS MAGAZINE

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INFORMAL TESTS FOR THE INDUSTRIAL ARTS

Victor J. Smith, Professor of Industrial Education, Sul Ross State Teachers' College, Alpine, Texas

TEACHERS OF DRAWING or shop activities are often very skeptical of the bookish methods used by academic teachers. But thinking industrial-arts teachers are more and more studying the methods approved by modern scientific educators and are willing to at least experiment with the instructional devices of the regular classroom. Among devices which have been used with some success by industrial-arts men are: Flash cards, graphs, bulletin boards, lantern slides, motion pictures, books for texts and related reading, magazine references, special written reports, informal testing, etc.

It is with the topic of informal testing in the field of industrial arts that this paper deals, and the term "informal" has been used to differentiate these tests from standardized tests. An attempt is made to summarize the several kinds of tests which are suitable for use in practical-arts instruction, to call attention to some of the advantages and disadvantages of each, and to suggest examples of how the tests may be used. Those, who are interested, may enlarge upon and adapt one or more types to their own classroom situation.

Concerning the instructor and his use of tests, it seems reasonable to accept the following as essential items among the industrial-arts teacher's duties:

1. Testing to determine what has already been learned in order to eliminate repetition and to isolate items which have not as yet been taught.

2. The selection of teaching materials which still remains to be presented, such selection to be based upon clearly defined objectives.

3. Testing in order to determine whether or not the essential parts of the new subject matter have been successfully presented.

4. The strengthening of weak spots or retrenching.

5. Retesting from time to time in order to measure the student's retentivity and his ability to react with information or skill in accord with accepted standards.

The testing or checking phase of industrial-arts instruction has probably never received its due share of attention. Tests ought to be designed not only to indicate what remains to be accomplished by the student but also to show how teaching methods can be reorganized in order to gain greater efficiency and economy of time. That the industrial-arts teacher should use more such tests in the evaluation of his work is not to be doubted. I once knew a manual-training teacher who went into a community for the purpose of opening a new department. His first statement to a shop class was, "One thing, boys, you will be bothered with no examinations in the shop." Some of the boys rather approved of this method, yet as an educational unit the shopwork immediately dropped in the estimation of the school as a whole since the idea of many was, "If there is nothing to test, there is nothing to learn." Possibly nothing would help to kill the snap-course idea more quickly than the intelligent use of a variety of tests so designed as to call attention to the enormous body of worth-while subject matter—real educational material—which is a part of, or is closely related to, shop or drawing courses. Tests imply standards.

Since so much progress has been made in the use of instruction sheets, the checking-up factor becomes more and more important in order that the effectiveness of such a teaching method may be determined. Any set of instruction sheets which is worthy of the name, will contain thought-provoking materials, explanations, directions, problems, related information, and some specific references which will be of value especially to those who may lack the field of preparation assumed for the class as a whole, thus providing for individual student differences. The extensive use of instruction sheets tends toward the general assumption that all or most of the information intended to be passed out is caught and retained by the student who hands in an acceptable finished job. Such an assumption may or may not be valid, depending upon such factors as one student quietly assisting another, or the student following directions or copying work without fully understanding, or similar factors. An appropriate series of tests will act as a definite check of the effectiveness of the informational content of the instruction sheet.

The advantages, therefore, which may be expected from the proper use of informal tests may be listed as follows:

a) They measure to a fair degree the progress of the student in certain technical or informational phases of the industrial-arts subject matter.

b) They call the student's attention to important details as well as to assist him in the organization of larger bodies of worth-while materials.

c) They provide the instructor with a definite written record of progress which is a more reliable and useful index than an estimate or less carefully worked-out system.

d) They tend to increase the student's respect for the subject.

e) They tend to keep the student's attention better focussed upon text assignments, related readings, etc.

f) They provide the instructor with a check upon himself and his methods as well as indicating important points which should receive further stress.

g) They bear an important relationship to grades as incentives to faithful and attentive students, as factors in the

elimination of the wholly unfit, and as indicators of scholastic accomplishment.

Each of the following paragraphs deal with a distinct type of test which may be utilized in any branch of industrial-arts instruction. Each type, except the formal question-and-answer method, offers the important advantage of economy of time, both in the administration of the test and in the grading of papers. In several cases, pasteboard templates can be made which will indicate at a glance the errors made. In most cases a mimeograph or other duplicating device is desirable or necessary.

1. Traditional or Discourse Answer Method

Type Question: Discuss threading on the machine lathe, including the setting up of the machine, the cutting tool and its adjustment, and the operations involved.

The answer to this may vary from one or two sentences to several pages, depending upon the student's knowledge of correct procedure as well as upon his skill in organizing his information logically and grammatically.

This type of question, of course, has its legitimate use, but the answers vary in length, quality, and organization. They are, therefore, very difficult to grade with any real degree of accuracy or fairness. Furthermore, though the above question seems at first glance to be specific, yet the same credit would have to be given to the student who gave a satisfactory description of the simplest kind of threading on a quick-change lathe, as to one who described fully the machine operations involved in large pipe work, or the cutting of female threads, or the use of a lathe which required the calculation of change gears, or included other complex details.

2. True-False Method

(Underlining True or False)

Examples: A number 9 f. h. b. screw is larger than a number 12. T F

The pencil should travel from left to right on the T square. T F

Flat-tail dogs are for the lathes, round-tail dogs are for the milling machine. T F

High-speed-steel cutters throw a white spark on the emery wheel while carbon steel throws a dark red spark. T F

For a true-false test of this kind a large number of questions should be carefully selected. If such a test really functions, each statement calls for prompt reflective thinking before it can be correctly answered. One satisfactory method of scoring is to deduct the number of wrong answers from the right, the remainder representing a score (R—W=S) which may be plotted to form a curve for purposes of evaluation. Unless the statements are selected with care, it is possible that the better plan would be to have no test at all. A reliable educational journal recently published a "True and False Test" of which the following is a part:

A square is an angle of (45) (90) degrees.
Linseed oil comes from (the whale) (flaxseed).

Such a test, of course, is not a true-false test but a selection test in which the student has a 50-per-cent chance of getting a perfect score even though he be in absolute ignorance of the subject matter covered. Concerning the first of the above questions, what does the author of the test mean by "square"? In the second, the correct answer is only too evident. It requires little or no reflective thinking. Besides this the student may be led to believe that one need only to press flaxseed in order to secure commercial linseed oil. In a true-false test the same propositions might have been stated as follows:

A right angle is an angle of 45 degrees. True False
The raw material for linseed oil comes from flaxseed. True False

3. Selection Test—A Recognition or Multiple-Choice Test

(Underline the correct statement)

Example: The best saw for the purpose of sawing out small, thin, wood toys is:

backsaw turning saw compass saw
ripsaw crosscut saw coping saw

The raw material for the manufacture of turpentine comes from:

animal fats crude oil alcohol
naphtha trees gasoline

An important factor in the organization of a satisfactory selection test is the inclusion of as large a variety as is reasonable to select from so that the student will be forced to consider the question seriously and choose intelligently from a body of information already mastered. Absurdities must be avoided or the test becomes a joke. For example, the following have been selected from a printed and widely distributed industrial-arts test:

Saw milling pertains to which of the following?
(1) farming (3) fishing
(2) lumbering (4) mining

How many inches are there in 3 yards, 1 foot, 4 inches?
(1) 124 (3) 160
(2) 152 (4) 110

Edge tools are made of:
(1) tempered steel (3) lead
(2) copper (4) brass

The correct answer to the first is too obvious to justify the question. The second has no place in a selection list as it fits so well into the one-word-answer type, described in section 4 of this article. The third would be much improved by being revised in the following manner:

Woodcutting tools are made of:
(1) mild steel (4) cast steel
(2) tempered steel (5) high-speed steel
(3) octagon steel bars (6) low-carbon steel

4. One-Word-Answer or Recall Method

(Write in the right word.)

Example: What is the term used by draftsmen to denote the reduction in the size of an object for drawing purposes?
Answer: .....

This type of question, as previously indicated, is of service for brief questions involving mathematics as well as a variety of other types.

5. Completion or Incomplete-Sentence Method

In this type of test, the student is asked to fill in the blanks. Sometimes the number of dots or dashes in the blank space is intended to denote the number of letters in the correct word. This is not recommended as two terms may be of equal value.

(Fill in the blanks)

Example: In the process of boring a hole in a piece of wood, the mechanic must be careful to..... from.....directions in order to insure the.....position of the.....and he must also know when the.....comes through in order that he may .....the piece.....and prevent.....*by* finishing the operation from the.....side.

6. Key-Word Test

Note to student: Opposite each of the following words write one brief sentence indicating the principal use, function, or meaning of the term in question.

Word	Typical Answer
Anneal	Process of softening steel by means of slow cooling.
Shellac	A spirit varnish used in woodfinishing.
2H, 3B, etc.	Terms which indicate relative hardness (H) or softness (B) of drawing pencils.
Specification	A written description of a project as for a patent-office drawing or house plan.

I have found this type of test very serviceable where it was necessary to cover a large amount of subject matter in a relatively short time.

7. Visual or Identification Method

This test may be presented in two ways, first, a series of objects may be held before the class for a moment each and the student requested to number and write the name of each object or part called for; second, numbered objects mounted permanently for display purposes may be placed before a class for similar identification. Such a test may include tools, machine parts, kinds of materials, kinds of drawings, or things of a similar nature.

8. The List Test

In this type of test the question calls for a definite list, avoiding discourse forms and calling for a definite knowledge of subject matter.

Examples: List all of the wood saws used during the term. Examine the rough pulley casting and blue print for same. List the tool operations necessary to complete the project.

9. Outline Method

Example: Outline, as you might properly do for an English composition, the main and subheadings for a paper on woodfinishing. Typical answer:

Woodfinishing

I. Stains.
  a) Water.
  b) Spirit.
  c) Chemical.
II. Fillers.
  a) Liquid.
  b) Paste.
III. Polishes.
  a) Oil.
  b) Wax.
  c) Varnish.
    1. Shellac.
    2. Copal.
IV. Opaque Finishes.
  a) Paint.
  b) Enamels.

Note: Under each of the above, a complete outline will mention materials and manufacture, advantages and disadvantages, preparation of surfaces, and method of application.

10. Tabulation or Chart Method

Problem: Sketch the following chart on a sheet of paper and fill in the spaces with the information called for. Make a dash where the subject matter called for does not apply.

Kind of drawing	Are dimensions altered? How?	Angles used	Any special relationship of faces or views
Orthographic projection			
Isometric proj.			
Oblique proj.			
Cabinet drawing			
Perspective			

The information card at each lathe indicates its various speeds. Fill out the following chart indicating the correct use of these speeds for average work with carbon-steel cutters:

List five metals	Roughing cut	Finishing cut	Feed per minute

As will be immediately seen, such a chart will indicate at a glance quite a field of information. A discourse answer related to the same topics would become almost hopeless, both from the standpoint of the student attempting to answer the question and from the teacher attempting to evaluate or interpret the answer.

11. What's-Wrong Test

This test may be quickly and effectively used, but the preparation of the required large illustrated cards is not easy. Once assembled, however, the material may be used from year to year. For class purposes I have found that heavy white cardboard about 12 by 18 in. with drawings in black ink are suitable. For example, one card shows a boy about to joint a very short piece of wood. Another shows a student about to start a machine lathe with the T-wrench still in the chuck. There are endless possibilities for this test which finds its chief value in quickly calling attention to small but vital points often overlooked or forgotten by the pupil.

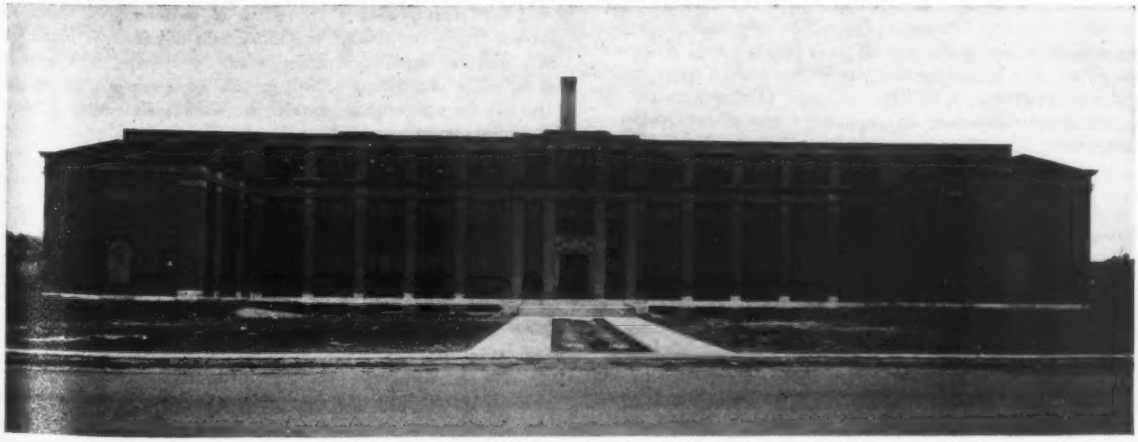
12. Nomenclature or Picture Test

This is another test which requires an illustration but this time in such form as to be available for each student taking the test. For example, a mimeographed picture of a lathe with the important parts numbered is handed to each student. A list of the parts by number is called for. Another good project for this method is that of the house in section with parts numbered.

13. Working, Performance, or Demonstration Method

This test involves the actual construction work for some assigned project at the bench, desk, or machine. The test must be so designed as to include the essential processes of the unit or trade involved. To the average teacher this test is most valuable in getting acquainted with the ability or accomplishments of strange students and in determining the fitness of students where advanced standing is claimed. It should, however, find little place as a test in laboratory classes which have been under observation for some time. It is primarily a test of skill but may include knowledge and facts, and ability to use such knowledge as well.

In conclusion, let me say that I am not an advocate of endless testing or tying oneself to grades and unnecessary red tape. Nor would I let these things come between the teacher and some of the more worth-while personal relationships of teacher and pupil. My plea, however, is for a more careful checking up and measuring of results in a form adapted to the needs of the class. A method of checking worked out in such a way that the administration of the tests may be done with a minimum of class time as well as a minimum of time spent by the teacher in grading, and that the result may be an increased accuracy of marks, a better organization of teaching materials, and a nearer approach to the attainment of worth-while objectives.



SENECA VOCATIONAL SCHOOL, BUFFALO, NEW YORK

This school was opened in September, 1926. The electrical trades, tool and die making, machine shop practice, photography, and steam engineering are taught at this school.

SOME TEACHING RUDIMENTS RECALLED

Joseph J. Lukowitz, Milwaukee, Wisconsin

BECAUSE OF A LACK of full understanding of the objectives of industrial-arts work, the industrial arts have been looked upon with a sort of awe or a form of tolerance by some of our fellow teachers in academic work. Others in the academic field, especially those of the homemaking sex, are enthusiastic about the work, seeming to justify it because of the intrinsic value of the articles made by the pupils. Others still have the "handy-man-about-the-house" idea. They would justify the industrial-arts instruction on the basis of its possible utilitarian value in later life.

All of these aims or purposes are well founded and worth while, but if they represent the full scope of our work, if we emphasize production to the exclusion of more basic educational objectives, we are falling far short of making use of a fine educational, or permit me to use the term, pedagogical situation.

Making Studies Purposeful

Our academic teachers are making great efforts to make the various studies purposeful to the pupils, for they realize that then and then only have they an attractive learning situation (attractive to the pupils). They know that under such a condition the problems of interest and attention, two things which are absolutely fundamental to the learning process, are automatically assured, and the problem of discipline is reduced to a minimum. The exponents of the doctrine of formal discipline will always have enough left, which I dare say, will steadily become more and more distasteful to the pupil because of the steady advances being made in educational technic. It is not meant to infer that formal discipline has no more place in a system of education; there is still some difference of opinion on this point among the leading educators of our day.

The much heralded "project method" which has been so aptly defined as "purposeful activity," may be said to have had its inception in industrial-arts work, which surely is purposeful to the pupils. For when the need of some article is felt or when it is necessary to operate on materials, the pupil certainly feels a purpose, a reason if you please, for whatever he does to accomplish the task.

Experiencing a need, plans for meeting or satisfying the need, the tools, their manipulation, the materials of construction, and in the end the verification of the ideas and conclusions exemplified by the finished article certainly constitutes an ideal learning situation. Now, this ideal situation exists potentially in our work, but all too often we neglect to make use of it. We ignore the situation entirely when we repeatedly and without reserve say, "Do this," and "Then do that." We ignore it entirely when we repeatedly give direct answers to questions which we ought to turn into questions to be answered by the pupil.

Developing the Reasoning Faculty

Remember, it is no small part of our job to do our part in developing the reasoning faculty. We are not engaged in a commercial enterprise where production is paramount. Remember, that addressing a question to a designated individual, when the whole class is in attention, is no incentive for any one to think but the person questioned. Better ask the question, pause a while, and then designate some individual to answer the question. Never allow an answer in chorus without permission, or permit an individual to answer without permission, because this, too, will be no incentive for others to think. Remember that teaching is a drawing-out process and not a pouring-in process. Therefore, ask questions, thought-provoking questions, and ask them in the right way. Avoid asking a question where possible, that can be answered by *yes* or *no*. If it is answered in that way, immediately ask *why*. This *why* question is designed to keep the class alert and thinking on the subject under consideration.

Questions—Individually or Collectively

How can you ask all of these questions when every boy is engaged in different work and most of the questions may be unrelated to the work being done by the individual members of the class? One solution of this difficulty would be to deal individually with each boy, making all questions a personal matter with him. Such a system is impractical beyond a certain point, in most cases, because of the physical limitations of the teacher. Another successful method is to call the class together and consider something that is common to all or pick out some boy's work and have the entire class consider it. But try to select an interesting and purposeful problem for the attention and discussion of the entire class; one that will provoke thought and possibly suggest to the individual boys, methods of approach to the solution of their own individual problems. Unless the problem under class discussion has some close connection with the boys' work, many boys are likely to take the, "I'm-not-making-that" attitude with the inevitable result of poor attention and loss of interest. Of course, where the entire class is working on the same or similar problems, it is not nearly so difficult to hold the attention of the class, especially if the problem is purposeful to the boys.

Until traditional formal drill in certain academic work was sugar-coated by games and other devices and made purposeful in numerous ways by some of our ingenious coworkers in the academic field, these studies were distasteful to the pupils and, of course, an ideal learning situation did not exist. The above thought is in accord with what is known as the "project method," and industrial-arts work has the "project," so to speak, but we teachers must supply the "method."

Suggestions by the Student

When a suggestion is made by some member of the class —and we should ask for suggestions in order to stimulate thought—don't reject it if you can possibly avoid doing so; remember that repeated rejection stifles initiative. If the idea has anything good in it, use it, even if you enlarge upon it. At any rate, commend the suggestions and ask for more; it is a part of this drawing-out process referred to.

We should always strive for a reasonable amount of system and order about the shop, for it is the boy's first contact with the work of industry where he actually takes a part in it. The impression he will get, or far more important, the attitude he will acquire toward the work, will benefit him to an extent depending on how the situation is handled in school. However, antiquated pedagogical methods of order or discipline have no place in the school of today, much less in the school shop.

It is the hope of the author that this little discussion of some of the very rudiments of teaching may stimulate some thought and expression about methods of teaching so that, not unlike our coworkers in the academic field, we too may profit from some study and discussion of this aspect of our work, and from the exchange of ideas among ourselves.

By observing the principles of education in our teaching and otherwise using our best judgment, we will have avoided the development in our pupils of mere ability to follow fool-proof orders and instead we will be compensated by a greater satisfaction in seeing a happy coordination of mental and motor development in our pupils.

THE ART COURSE AND THE PROJECT METHOD

Helen M. Stockton, Westfield, N. J.

The project method, although still in its infancy, has had a far-reaching effect upon all the studies included in the curriculum. That this method of procedure is a step in the right direction is generally conceded, but the fact that its introduction has caused confusion and educational unrest, is also beyond question.

It is apparent to those who have given time and thought to this matter, that the art courses throughout the country face total disintegration unless this new method be considered carefully and be dealt with competently. It is equally clear to those vitally interested, that definite results can not be obtained unless definite demands be made.

A well-organized, systematic, carefully-graded art course is more necessary today than ever before.

This statement is based upon results obtained in communities where the art courses have been overridden in order to conform to the demands of the project method.

Wherever this has happened, the artwork has degenerated into nothing more than poorly presented illustrative work, called *illustration* or *free expression*. These impressive titles have been used to cover a multitude of sins.

It is not my purpose to belittle or minimize the value of free expression properly presented, but it is my purpose to make clear that before we demand free expression we must give the child the technic required for that expression. Technic is a means of expressing ideas. It is a means to an end, and as such it is of vast importance.

Problems requiring a certain art knowledge or technic should not be presented until after the child has acquired enough information to enable him to make an intelligent effort. That a teacher ask a child to express in French his ideas of "Pilgrims going to church," or the "Indians hunting," without first having taught him a few rudiments of that language, seems preposterous, yet to demand that a child express these ideas in an equally unknown art language is an everyday occurrence.

As has been said, illustration properly presented constitutes an important part of the art course, but a part must never be mistaken for the whole.

Illustration is one, and only one, component part of a well-organized art course. It holds the same relative position in that course as does addition or subtraction in the arithmetic course. The results obtained by teaching subtraction in lieu of arithmetic would be as meager as those obtained by teaching illustration in lieu of art.

A well-organized art course is much like a well-organized household: "A place for everything and everything in its place."

The art supervisors, on the one hand, contend that a systematic, carefully graded art course is imperative; the grade teachers, on the other hand, maintain that such a course does not conform in content with their individual projects and therefore cannot be followed.

The problem then becomes one of adjustment between the supervisor and her subject matter, and the grade teacher and her method. That patience and cooperation are necessary to make this adjustment is evident. Equally evident is, or ought to be, the fact that the ultimate aim of art supervisors and grade teachers alike, is not a perfect course, nor a perfect method, but a perfect child.

Let the supervisor then plan a course in which we find a place for everything. A course abstract enough to be readily adapted to individual projects, and yet definite enough to insure unity, and to protect against overlapping and repetition. For example, if poster work is required in certain grades, the type of letter to be used, the color scheme, and the execution should be determined by the supervisor for each particular grade. If this is not done, several successive grades are likely to undertake similar or even identical problems.

The grade teacher having her art aims and problems outlined for her has then to adapt her art material to this particular project. In the case of a poster she will help the children choose one closely connected with the project in hand, or if her outline calls for circular perspective and use of pencil, and her project be Indian life, she will have the children draw Indian bowls, which will serve to teach circular perspective and use of pencil, and at the same time, stress this phase of the Indian project. Perhaps the supervisor's outline for the first grade calls for *representation;* the human figure (action lines) standing, walking, sitting, jumping, etc. Whether these figures be Chinese, Dutch, English, or Eskimo, depends wholly upon the grade teacher and her particular project.

Countless illustrations to show the practicability of this general scheme of cooperation might be given here but the outline which is part of this article, make more seem unnecessary.

However, it is well to remember that even though the grade teacher be provided with a well-organized, systematic, carefully-graded outline, she will not be successful as an art teacher unless she accepts this subject in its broadest sense, as an inseparable part of a well-rounded everyday life. She must weave it into her project on every suitable occasion, not as busy-work nor as relaxation, but as a vital, contributing, indispensable factor. She must plan her art lessons with the same precision, interest, and thoroughness that characterize the preparation of her other work, and last but not least, she must adjust her work to the mental and social life of the children with whom she is working.

Cynics have said that modern educators are today perfecting a method of teaching *nothing*. Let us be on our guard against this. In our zeal for logical subject matter and better methods let us not lose sight, even for a single moment, that the child is after all the real, primary consideration in education.

The following outline is the joint work of Mrs. Curtis R. Crowell and the author, both of the Trenton Normal School. It is suggestive only and must be adapted to particular situations and individual needs.

DRAWING

Grades I to VI

I. General aims.
   1. To encourage attentive observation.
   2. To clarify ideas.
   3. To stimulate imagination.
   4. To train for neatness and facility in the use. of ordinary drawing mediums.
   5. To give opportunity for use and enjoyment of—
      a) Color.
      b) Design.
      c) Pictures.

II. Ways and means of attaining these aims.
   1. Selection of problems in connection with particular project, which will
      a) Develop progressive ability in:

(1) Lettering.
(2) Representation.
(3) Illustration.
(4) Appropriate use of color.
(5) Selection, adaptation, or invention of suitable designs and their application.

b) Give practice in the most useful mediums:
(1) Paper cutting.
(2) Brush and paint.
(3) Crayon.
(4) Pencil.
(5) Blackboard.

2. Arrangement of surroundings and attention to personal appearance to give or arouse satisfaction in:
(1) Orderliness.
(2) Harmonious color.
(3) Good pictures.

III. Distribution of emphasis (approximate time allotment) for the different mediums.

MEDIUMS	GRADES I	II	III	IV	V	VI
Paper cutting	1/2	1/3	1/4	1/8	Little, if any	0
Brush and paint	1/2	1/3	3/8	3/8	1/2	1/4
Crayon	1/2	1/3	1/4	1/4	1/8	1/4
Pencil	0	Little	1/8	1/4	3/8	1/2
Blackboard	As much as possible in all grades.					

DRAWING IV. Standards of Attainment in the Different Kinds of Work

Work in Lettering, Capitals Throughout

Grade I	II	III	IV	V	VI
Poster Bisymmetrical. Free cut on fold. Large, 9 by 9 in.	*Poster* Drawing with pencil 4 by 4 in. spaces 1-in. section and cutting.	*Poster* Drawing with pencil 4 by 5 in., ½-in. cross section paper.	*Poster* Drawing with pencil 4 by 5 in., ¼-in. squared paper cut.	*Poster* As in IV. More freely and easily.	*Poster* Double line. Draw freehand to fit a given space.
Single Stroke Crayola. One initial in 1-in. square.	*Single stroke* Crayola. First name. 1-in. squared paper.	*Single Stroke* Pencil.	*Single stroke* Pencil. Any words in ½-in. templet. Initial and last name in ¼-in. templet. Two initials in square or circle.	Two initials in any geometric figure.	*Single stroke* As above. Initial and last name in 1/8-in. templet. Monograms.

Work in Representation

Human figure— Action lines Animals—2 Rabbit, bear, elephant, etc. Birds—2 Chicken, pigeon, etc. Plants—2 or 3 Asters, tulips, bulbs, and vegetable roots. Simple leaves Large simple flower on single stem. Large simple fruit. Trees—2 Maple, Christmas. Constructed objects— Toys.	Human figure— Action lines filled in. Animals—3 or 4 Cat, squirrel, seal, reindeer. Birds— Sparrow, robin, etc. Plants— As in I extended. Trees. Constructed objects.	As in I and II— Improved and extended. Iris, goldenrod. Two dimensions.	Human figure— Action continued. More attention to proportion, details. Some foreshortening. Animals. Birds. Plants— Chosen according to needs in nature study and projects. Begin outline drawing in pencil. Constructed objects. Circular perspective.	Better proportion. More detailed outline. Pencil outline. Add foreshortening in one-point perspective.	As in V. Add simple two-point perspective.

Work in Illustration

No Perspective Figures and objects drawn on a line. Emphasis on ideas and groupings rather than on faithful representation. Imaginative.	*Perspective of Size and Placing Landscape* Background level land and sky or all water and sky. For figures and objects in picture drawing see Rep. above.	*Perspective as in II* *Landscape*— With hills, trees. Local types — see Rep. above.	*Perspective—as above.* *Landscape*— With land area, water, trees, etc. Typical of countries studied.	*Perspective—as above* *Landscape*— With building, etc. To illustrate history.	*Perspective—as above* *Landscape*— As in V.

Work in Color

Hue The 6 spectrum colors; recognize and name.	*Hue*—6 Derivation of binaries from primaries. *Value* Matching light and dark hues. *Flat Washes* over small area (for land and water above).	*Hue*—6 Free use in illustration. Restrained use in design—contrast. *Value* Matching and use of 3 values of any hue. *Flat washes* as in II.	*Hue*—Recognize—12 Derive. Six intermediate. Introduce monochromatic schemes in design. *Values*—5 values of any hue. Normal— 2 tints. 2 shades.	*Hues*—12 Introduce analogous schemes. *Values*—5 Neutral and colors.	*Hue*—12 Producing any color desired by mixing. Changing one hue to any other hue. Changing a hue to gray. Introduce complimentary schemes. *Values*—5 *Intensities*—2

Work in Design

Placing of any drawing to avoid corners and edges of paper. *Margins* in mounted work. *Single decorative spot* drawn or cut freehand centrally mounted. *Repetition in Border* of interesting units. Freehand.	*Good Placing* of any drawing and adapting its size to space on paper. *Clean Margins* Freehand margin lines and neat corners. *Single decorative spot* Freehand drawn. Stick printed units. Simple bisymmetrical forms cut from once-folded paper for stencils. Balanced placing. *Repetition in Border.* Surface patterns— 1-in. squared paper. Freehand units, geometrical form with stenciled points.	*Placing* as in II with more insistence on results. *Margins* Freehand. Lower margin wider. *Single decorative spot* As in II. Balanced placing. *Repetition in Border* and surface patterns as in II. Stencils for borders cut from folded strips of paper.	*Placing* of any drawing with reference to center of interest, space division, etc. *Margins* As in III with better quality of line. *Single decorative spot* Somewhat conventionalized bisymmetrical arrangement of cut-out forms. Balanced placing. Teach balance. *Repetition in Borders* and surface *patterns.* Stick printed, stenciled.	*Placing* Review and practice as in IV. *Margins* (may use double lined) freehand. Careful attention to relative widths of upper and lower sides. *Single decorative spot* Conventionalized on squared paper cut from squares of paper folded on diagonals. Balanced placing. Teach unity. *Rhythmic Repetition* Any of the foregoing with better technic. Teach rhythm, may use analogy of musical rhythm.	*Composition* Teach as such. *Margins* (may use 2 or more lines, varying width) freehand. Well related. *Single decorative spot* Freehand decorative drawings and formal designs with better technic in manner best adapted to problem in hand. Balanced placing. Teach harmony. *Repetition with Unity* Harmony + variety. Free and faced repetitions in border and surface patterns. Teach variety.

Geometric shapes and terms, measuring, ruling, transferring, etc., may be added to the above outline if desired.

HELPFUL HINTS TO INEXPERIENCED PRINTING TEACHERS

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THERE WILL BE MANY MEN who will teach printing this year for the first time. Coming to the school shop, fresh from college, normal school, or the industrial field, with only a vicarious knowledge of the problems of the school printshop, they are due to receive a few minor shocks while they are adjusting their theories to the facts confronting them. A few ideas on the subject from a teacher who has recently gone through the same process of adjustment may act as a shock absorber and prevent a few shops from becoming nightmares of scrambled cases and misplaced equipment.

The first thing that may surprise the new teacher is the very small dose of information which the average-grade pupil can absorb at one time. Lessons and processes must be broken up into very small bites and each bite given time to digest before another bite is given. For this reason the teacher must not expect very rapid progress from the seventh- or eighth-grade beginning classes. He must proceed slowly and thoroughly, and with a great deal of repetition to get his classes started on the way he wants them to go.

The second surprise which may await the teacher is in his advanced classes: those who have had printing under another teacher. It will not be profitable, no matter how good the previous teacher, to take it for granted that the pupils know much of anything. Obviously, however, the pupils must not become acquainted with the teacher's lack of confidence in their ability. But the new teacher should not assign any work of a difficult nature to any of these students until he has found by testing on easy problems just about what their limitations may be.

It is the purpose of this paper to advise the new teacher of printing concerning some of the things to take care of when taking charge of a shop, and to assist him in starting both his beginning and his advanced classes.

A shop teacher should always get on the job a few days before school opens. The first step is to carefully study the inventory of equipment and learn the location of everything in the shop. If necessary, make a written note of such items as might be forgotten. Once a class gets into action the teacher must not lose time hunting for some piece of machine equipment or stray sorts. The next step is to glance over the available reference material, textbooks, lesson sheets, and records left by his predecessor.

Failure of a shop's equipment to come up to a teacher's expectations can wreak havoc with a teacher's carefully planned course of study. There may not be enough cases of one size of type to provide all pupils with uniform cases: There may not be enough presses to teach any amount of presswork. The teacher may have some idea of the work he wishes to cover before he sees the shop, but he must expect to make radical changes in his plans.

In looking over the machinery in the shop, the teacher should carefully examine it to see if it is in good order. At any rate, it must be made ready to run before the first class meets. The janitor or engineer should be consulted about any defective motors, the power supply, fuses, switches, and the like.

After getting acquainted with his shop, the teacher will get in touch with his principal and director of manual training to learn about the organization of his classes, and to find out what red tape is tied around the printshop. As a rule there will be more of this than there would be in a woodworking shop because of the production end of the work.

Enumerating the things the teacher will need to find out from the principal, we get quite a list, which I shall discuss serially later.

1. Hours of beginning and ending of school.
2. The teacher's hours.
3. Program of printing classes, including number of pupils to the class, grade of class, number of recitations per week, length of recitations, number of weeks course will run.
4. Aim of the course from the principal's standpoint.
5. Is printing elective or required?
6. Is there a stated course of study to be followed?
7. Will classes be graded or ungraded?
8. How much production work is expected, and how is it handled?
9. How are supplies purchased or ordered?
10. Has the printshop been printing a school paper, and if so, what are the printing instructor's duties in connection with it?
11. What relations, if any, does the printing department maintain with other departments?

The printing instructor will have planned a course of study before he comes to his school, but the answers to questions number 3 and 4 will strongly influence its final shape. The classes may consist of from ten to twenty-five, or even thirty pupils, and there is a tremendous difference between the method used in teaching a class of ten, and the mass method (and lower standards of quantity and quality of work done) which must be used with a large class.

In some schools pupils report daily for ten weeks, in others three times a week for twenty weeks. In still others, pupils spend one whole afternoon once a week for a certain number of weeks.

The aim of the course is, in some schools, left to the teacher. In other schools it is decided for him. Most schools prefer a tryout, prevocational, or cultural aim in the upper grades or junior high school, and a vocational aim in senior-high-school grades. Many schools, however, continue the general and cultural aim throughout the entire course. The teacher's plans are chiefly affected by the aim in their content of related material for lecture and written work, and in the amount of skill expected at the close of the course, skill being secured by repetition at the sacrifice of variety and number of new things taught.

Whether pupils elect or are required to take printing has relatively little effect on the class in the lower grades. If they elect a subject it is because they consider it easier than some other alternative, and if they are required to take it they philosophically accept it just as they accept arithmetic and grammar. The teacher must try to make his subject interesting by careful yet enthusiastic teaching, neither hurrying his pupils faster than they can assimilate the subject, not allowing them to kill their own interest by dawdling or ineffective work.

A graded class is one in which all pupils have the same status in regard to the subject. An ungraded one contains beginners mixed in with various grades of advanced pupils. Ungraded classes are all too common. They require a great deal more work and planning than a graded class, and the results are less satisfactory, but it is not always practicable to grade all classes, so the teacher must make the best of it. In

starting an ungraded class, get the advanced pupils to work and then let some of the more able ones help in taking care of the beginners.

As soon as the teacher learns how and where to order his supplies, he should check over his needs and fill them as far as possible. It is wise to go slow until his director or principal has enough confidence in his judgment to give him a freer hand. Within a few days after school opens, paper for proofs, ink, string, paste, scratch paper, a few pencils, wiping rags, and gasoline or benzine should be on hand.

Practically all schools expect the printshop to supply the blanks used in the building as well as to do other jobs for the school. The new teacher should tactfully intimate that he does not want to be stampeded with an overabundance of such work right at the beginning of the year. After he has his bearings he can work out a plan to fit his own situation. Production work is a boon to the teacher when it gives him the opportunity to assign interesting jobs to his pupils to be solved on the basis of previous instruction, but when the work comes so fast that the teacher has to take all the work of planning and the pupils merely do the common labor part of the job, production work is a nuisance. It is best if the teacher gives out the impression at once, that all jobs will be handled in turn and that no hurry-up jobs which have to be done tomorrow night will be accepted. No work should ever be done except for the school. There is no surer way to antagonize commercial printers than to take their bread and butter away from them.

If a school paper is published entirely by the printshop, the new teacher will need to postpone the first issue until he can get oriented in his shop. It is more likely, however, that an editorial staff will take care of that part of the work, and that a nucleus of this staff has been left from the previous year. In such a case any information needed can be secured from them.

The printshop's relation with other departments of the school may include clubs centering about the printshop, services rendered the athletic association in printing tickets, posters, schedules, etc. The printshop may deal directly with departments which want printing done, or all orders may go through the office. The new teacher should find out as much about such details as possible. He should inquire about towels and soap, janitor service, keys, how the pupils are to pass to and from classes, how the discipline is handled, how the room is ventilated and temperature can be regulated, and other questions of this kind.

With all the above information in mind the teacher is ready to make a written outline of the work he expects to cover during a semester or a year for each class, expecting to modify it as conditions may make it necessary. It does not fall within the scope of this paper to discuss courses of study. It may be suggested, however, that the outline should indicate what the pupil is to learn, what exercises he is to work, what he is to read in the matter of information, what subjects are to be discussed, or lectured about, or what written work is to be done by the pupils. Provision should be made, not only for teaching the technic of handling the materials of printing, but also for formally teaching capitalization, punctuation, and the mathematics of printing. These elements of the course should not be left for haphazard incidental instruction.

Materials for the first day's classes should be in readiness before the classes meet. Plenty of scratch paper, a few pencils, enrollment blanks, and pica rules, should be on the teacher's desk. The cases to be used by the beginners should be on the composing stands ready to use. Several diagrams of the case should be on the blackboard and an empty case at hand.

Meeting the Class for the First Time

As the pupils come into the room, the teacher should stand just inside or outside the door, and with a pleasant expression and a quiet tone of voice give whatever directions are needed in getting his class seated and ready for their first instruction. This is the moment for which the teacher has been preparing since he entered the shop. He has learned how many pupils to expect and is all ready to put his well-formulated plans into action. The first few minutes with the class are very important. The pupils are just as busy making up their minds about their teacher as he is with trying to get their interest and attention, and in remembering to take care of all the details he has laid out for the first session with his class. If he knows what he wants to do, the pupils are quick to sense his competence and follow his leadership with confidence. If, on the other hand, the teacher has to search for supplies, if he hems and haws, while he gives directions, or if he appears to be in doubt over what to do next, the class will start to "try him out," with sometimes unpleasant consequences. A courteous "company" manner on the teacher's part, a polite ignoring of slight disturbances will smooth over the excitement of the first day at school with permanent satisfaction. If any direct correcting of conduct must be done, it should be done quietly, adequately and firmly, not in a loud bullying tone of voice, nor with threats of punishment. Teachers often say that they put the fear of the Lord in the class the first day. Perhaps an experienced teacher can successfully carry through such a practice, but the beginner might find himself in a position where he would have to back down with considerable embarrassment and harm to his success.

Before beginning instruction, the teacher must attend to whatever routine matters the principal may have indicated, such as having the pupils fill out enrollment slips. For his own benefit the teacher should have every pupil's name, grade, homeroom, and previous experience in printing. This information may be written on separate slips of paper by the pupils. The slips should then be collected and clipped together. In this form they can be used for taking the roll until the usual exchanging of classes, and changes of programs so inevitable at the beginning of the year, are over with. After the class is fully organized the names can then be placed on a permanent record. As soon as the slips are handed in, the pupils should be assigned to desks and told where to keep their work. This can be done by reading the names off the slips, asking for correct pronunciation at the same time, and notating for future reference both desk and locker numbers. As the names are called, each boy should be asked to stand. The teacher should take a good look at each boy as he rises. This may prevent the practical joke of enrolling an imaginary pupil. Thus, in one class the boys enrolled Emery Stone in a woodworking class and the instructor called this name when taking roll for six weeks before somebody explained the joke to him.

This routing will be uniform for both beginning and advanced classes, but beyond this point, practice will differ with each class.

Starting the Advanced Class

To get an advanced class started is much more difficult for the new teacher—even though he has taught before—than it is to get a class of beginners started. Bearing in mind that he should not take it for granted than any of his pupils know much more than the rudiments of the art, the teacher is wise if he begins his classes by having them all review the case. A diagram of the case in use in the shop, (news, California, or Yankee), should be drawn on the blackboard, and after a few minutes spent in oral drill, the teacher pointing to a compartment and the pupils calling the letter which belongs in it, the pupils should be set to work drawing the case and filling in all the letters. Neatness should be insisted on. The results of this test are of such diagnostic value that the teacher should keep the pupils' drawings for study. They will give a fine indication of the pupils' relative ability. Any pupil who is not practically perfect in locating all letters, spaces, and punctuation marks should be required to go to a case, find out

where his mistakes are, then draw another diagram. Some latitude may be allowed in case the pupil has forgotten the location of the seldom-used characters. As soon as each pupil hands in a satisfactory diagram, the teacher should assign a short problem such as setting up a list of the names of the members of the class, a paragraph from a newspaper, or a stanza from a poem. The fact that this is a test and that he is to expect no help should be impressed on every pupil. Directions for the job should be kept in writing by the pupil, and as each part is done the slip should be checked, and the work graded by the teacher as satisfactory or the opposite. The directions would probably provide for setting the type, tying up, taking proof, marking proof, correcting form, pulling revise, locking up and distributing.

By the time this test is concluded you will have a fair idea of the ability of your pupils. Those who claim that they have had considerable printing work may be asked to set a list of the projects which they have finished. One of these may then be selected for the test. The same thing can be done in testing ability in make-up, imposition, and presswork.

In testing for press knowledge, a short, written test in the interest of safety should precede actual work on the press. A boy who has had a little presswork, should know how to start and stop the press, what the throw-off is for, names and uses of several inks and papers, how to put in the form, what a gripper is, and how to set the counter.

If a boy claims to know the makeready, he can be tested in the same way. The teacher must not hesitate to use written tests no matter how his pupils dislike the process. The tests need not be graded, but they will show clearly what the pupil knows instead of what he thinks he knows. From the written results of the tests, the teacher can plan and assign exercises to fill the gaps in the pupil's training.

Another test which is very important will show what the pupils know about the location of materials. The teacher hands the pupil a galley containing a single letter of several sizes of type, reglet, furniture, etc. The pupil lists each piece of material and briefly indicates where to put it. He is free, of course, to move about the shop as he takes the test. Unless the new teacher knows which boys can safely put away materials, it is hardly safe to allow any of them to distribute mixed forms.

As each pupil's ability is discovered, he can be assigned to work according to the outline of study, beginning with whatever problem seems logical. He should be given written directions which indicate *what* is to be done. The teacher will tell him or have him read from the reference material on hand *how* to do it and *why*. Check over the job with the written directions, and grade each process preferably on a point basis, as described in a previous article in the INDUSTRIAL-ARTS MAGAZINE. Have each pupil keep his work in a notebook. Be especially careful in checking for distribution. Inspect cases used, and supervise closely any distribution of pi. So many boys like to put it in the quad box of the six-point case.

Starting the Beginning Class

In starting the beginning class, the teacher should bear in mind that he must teach proper printshop conduct, and the care as well as the use of materials. As the beginner is taught so will future advanced classes be.

It seems to be a common custom, and it is a good one, to first speak briefly on the importance of printing to a class of beginners. It is well to emphasize that printing is not only an industry, but also a civilizing process. Do a little reading, Mr. Printing Teacher, and find something definite and authoritative to tell your class of young hopefuls. Put across as much of the charm which printing has for you as is possible and do not forget to tell them that printing is an art. Prepare them for the drudgery, but point out that hard work will make men out of them. Add a *few* words about what you expect them to learn during the first term. Be brief. Be pleasant. Remember that the first impression of your personality will last a long time.

Next tell a bit about a piece of type and show them a large piece of it, using a letter like capital J, L, P, or R, which will show how types must be cast in reverse. The next logical step is to show the case and how the letters are arranged in it. Hold up an empty case and compare it with the diagram of a case on the blackboard. This makes an easy mental transition from case to diagram, which is important, as pupils who memorize the diagram are often confused when confronted by the actual case. Having built up a train of ideas from type, to case, to diagram, you are now ready to teach the case.

Teaching the Case

On this point job sheets and texts usually say "learn the location of the letters." This works all right for an older pupil such as a normal-school student who can work out his own method of memorizing the case. However, the average seventh- or eighth-grader will be a long time learning the case unless the teacher organizes and directs his effort. There are several methods, but the following will be found the most rapid and interesting:

The diagram on the blackboard is filled in by the teacher to show where the letters go, starting with the capital case. Digress a moment to show that J and U, having been invented after the rest of the alphabet was in use, were put in the next empty compartments. Point out that there are seven letters in a row, and call attention to the other characters kept in this section, then erase the letters but leave the diagram. The pupils will be able to fill in the diagram at once. Make them memorize the location of the end letters—A, H, P, X, and G, O, W, until they can call them every time the teacher points to the proper place on the diagram. Now get their minds back on the actual case by holding up an empty one before them; better still, hang the case on the wall. Point to the boxes in the case where the caps are kept and have the class again call the letters.

The boys by this time are restless and need action. They have been assigned to desks. Practice having them stand and pass quietly to their desks, then come back and be seated. After their performance of this suits you, explain to them while they are seated, what you want them to do at the cases. They are to look at the letters in the cap case, holding them with the nicks up and examine them with the idea of seeing what they look like upside down.

After a few moments of this, seat the pupils once more, and teach them the center section of the case. (I am referring to a California job case.) This section takes more time, but the same method is used as for the caps. After the diagram of the case has been filled in with the letters and figures, erase the letters one or two at a time, the pupils calling them as the box is pointed to. Follow the same order every time you go over the case in order to build up a "rote" association of ideas. The following order for example: 1 2 3 4 5 6 7 8 9 0, i s f g, o y p w, a r.

As soon as the response seems to be fairly throaty from the class when you point to the compartments on the blank diagram, repeat the process using the empty case instead of the diagram. Perhaps individual boys can point out every letter by now. Go back to the caps and see what they have forgotten. Presently, send the boys back to the cases, preserving good order at all times, and have them look at the figures and letters in the center section of the case.

The next step is to drill on the left-hand section and to have the boys look at those letters in their cases. If any part of the class period is left, the boys may copy the case diagram and take along the copies, after you have checked them, to memorize at home.

The moving back and forth from case to seats may seem to cause confusion but it is better to let the boys express their restlessness in such controlled action than to have them vent

it in mischief and inattention. Memorizing the case is strenuous mental effort and cannot be too long continued without relaxation.

Lesson No. 2

For the second meeting of the class, review the case, and for the sake of interest, show how to set type in a stick. To do this place a row or two of e's in the stick, then dump them back into the case. Next some other letter, preferably o's or a's are set. Do not use leads as yet.

With the boys at their seats, a little is told them about the printer's measuring system, and the use of points in designating type sizes. This prepares them for the information that the type which they handle is ten-point, or twelve-point as the case may be. When they go back to the cases, they will read the labels on them with some comprehension.

They should be taught at once how to handle the case. Let them practice putting away and getting out the cases, exaggerating the care with which they must perform this act.

Some more seat work is next. They must memorize the location of the punctuation marks and their names. It has been found that not all seventh-graders know the names of these marks.

Another good idea is to have the boys draw the letters as they appear when they are held nicks up. Some reference to their cases may be necessary. This is in preparation for teaching them to distinguish the "four demons,"—b, p, d, q.

Lesson No. 3

From now on the boys should know their cases with the exception of spacing material. It will be necessary to tell them again and again about the spaces and quads. Some may be so bad that they will fail to know the names of all the spacing material at the end of a year, though most of them will have the spaces well in mind after the first few jobs. Drill them first until they are able to pick out by name the three-em space and the three-em quad, next the two- and the three-em quads, and last the en quads and the four- and five-em spaces.

Spend part of this third period on space and then show the boys how to set the stick and to set short words, such as he and they, using leads and three-em spaces. Pay no attention to justification. Tell them how to set the words while they are at their seats and as soon as they begin setting, pass rapidly from one student to another, checking up the position at case, manner of holding the stick, placing letters under left thumb, etc. As soon as the words have been set, pass from student to student again, and show them how to distribute from the stick to the case, using the right hand just as they will do later in distributing from the galley.

While this work is going forward, be sure to keep your eye on the clock as it will take at least fifteen minutes to get the class seated. To have the bell ring with all sticks full of type is annoying.

Lesson No. 4

Begin with a rapid drill exercise on the case, then have the student pick out the space called for from a mixture of spaces and quads on a galley. Discuss and drill on the appearance of the four demons. Set words like bent, pup, nut, quad, using three-em spaces and filling the end of each line with as many three-em spaces as there is room for.

Lesson No. 5

Drill on the case and on the spaces. Leave a diagram of the case on the blackboard and have pupils draw it on paper. Then ask them to indicate all characters upon it.

The boys who do not know the case by this time should be kept in after school and made to get busy. Consult their homeroom teachers and make things a bit warm for them. There is no reason why a boy should not be perfect in his case at this time, and as you will want the class together you must spur the laggards to action. Half an hour after school works wonders, even on those who do not have to stay.

Lesson No. 6

Those who know the case will now be ready to set an exercise which can be dumped on the galley, tied up, proofed, and corrected, and you will be ready to put the rest of your plan of work into action. From this point on, use written tests freely. Examine cases for poor distribution and make the guilty party first draw the alphabet backwards and then hunt out the misplaced letters. May you have little pi.

THE RELATION OF GENERAL INTELLIGENCE TO MECHANICAL ABILITY

(General Intelligence based on Terman Group Test and Mechanical Ability based on Stenquist I and MacQuarrie Mechanical Aptitude Test.

Edna Board, Willa Marsh, Lynn E. Stockwell, Fresno, Calif.

WITH THE INCREASING OBJECTIVES in the field of guidance, it is not strange that the counselor has accepted the challenge of this question, "Who shall be guided toward shop instruction and experience, and what factors shall constitute a reliable basis for such guidance?" For a number of years it has been felt that students who lacked interest and ability in academic subjects should be placed in mechanical work. To a large extent this procedure has been followed, with the result that the shops have been filled with many boys who have found shopwork as difficult as academic subjects. This condition has caused shop instructors to request that students of a higher intelligence quotient be guided toward and programmed in shop courses.

In order to meet this problem the following study has been made with these objectives in mind:

a) To determine whether a relationship exists between the intelligence quotient as determined by the Terman Group Test, and mechanical aptitude as determined by the Stenquist Mechanical Test and the MacQuarrie Mechanical Test.

b) To determine the correlation between the MacQuarrie Mechanical Test and the Stenquist tests and to what extent these tests can be relied upon to predict mechanical ability.

c) To discover what relationship exists between mechanical test scores and future success in mechanical work.

Methods of Conducting the Study

In order to discover the relationship between general intelligence and mechanical aptitude about five hundred children were given the Terman Group Test, the Stenquist Mechanical Aptitude Test, and the MacQuarrie Mechanical Test. A random sampling of one hundred seventh- and eighth-grade pupils was tested in each of the five junior high schools in Fresno. The MacQuarrie Test was given on the same day in all schools by the junior-high-school counselors. The same groups were given the Stenquist Mechanical Test on the following day. In all the schools the conditions controlling the testing were as nearly alike as possible.

Results of Tests

In order that the results in this study may be interpreted in terms of the writer's method, the statements below are given relative to statistical terms:

The I.Q. or Intelligence Quotient is the mental age divided by the chronological age. The mental age is determined in this study by the use of the Terman Group Test.

A correlation is a statistical mathematical result which indicates the relationships between traits or abilities.

The coefficient of correlation is the actual figure which represents the correlation and is arrived at through the use of Pearson's formula $R=1-\frac{6 \text{ summation } D^2}{N(N^2-1)}$.*

A correlation of 1.0 is a perfect correlation which means that the traits or abilities are of equal rank.

A correlation of .50 is a very good correlation and shows that the traits or abilities vary in rank somewhat.

A correlation of .20 is a very low correlation which indicates a wide range in rank of the traits or abilities.

The specific results as indicated by the correlations are as follows:

Correlation between the Stenquist Test and I.Q.	.05
Correlation between the MacQuarrie Test and I.Q.	.23
Correlation between MacQuarrie Test and Stenquist	.29

The medians for the whole group were:

Stenquist Test	62.17
MacQuarrie Test	46.1
Intelligence Quotient	101.33

The student with the highest I.Q. (148) made a T score of 62 in the Stenquist Test and 62 in the MacQuarrie Test.

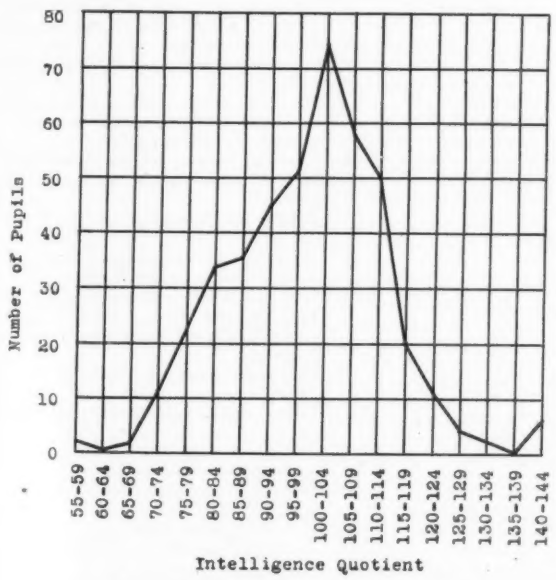
The student having the lowest I.Q. (67) made a T score of 34 in the Stenquist and 40 in the MacQuarrie Test.

The student making the highest score in the Stenquist (88) had an I.Q. of 85 and made 68 in the MacQuarrie Test.

The student makng the lowest score in the Stenquist (21) had an I.Q. of 106 and scored 61 in the MacQuarrie Test.

The student making the highest score in the MacQuarrie Test had an I.Q. of 112 and scored 80 in the Stenquist Test.

The first graph shows the range of distribution in the use of the Terman test.



TEST SCORES MADE IN THE TERMAN TEST.

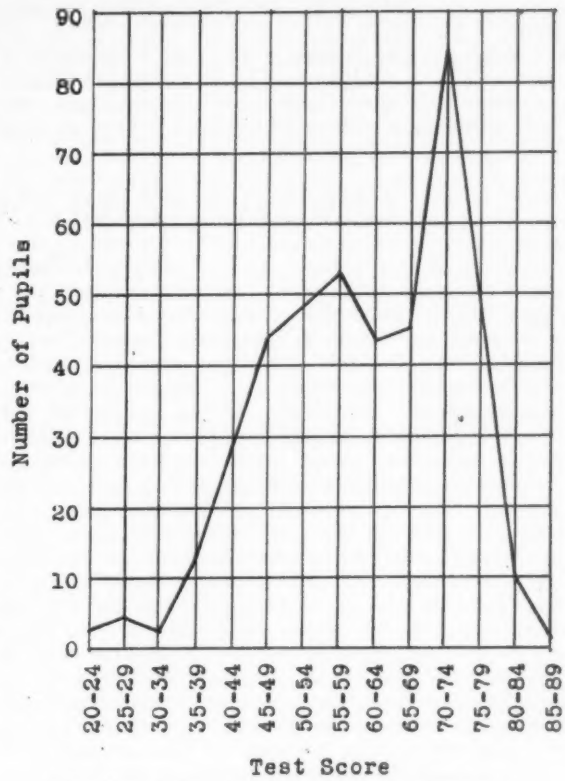
Terman Test

The second graph shows the distribution of test scores obtained from the Stenquist Mechanical Test. There is a possibility of a score of 95.

Stenquist No. 1

The third graph shows the range of distribution of the scores from the MacQuarrie Mechanical Test. There is a possibility of a score of 124. It is interesting to note that the scores in the Stenquist Test tended toward the upper quartile

*A readable book, one the layman can understand on "Measurements," Lincoln, Edward A., Beginnings in Educational Measurement, Lippincott.

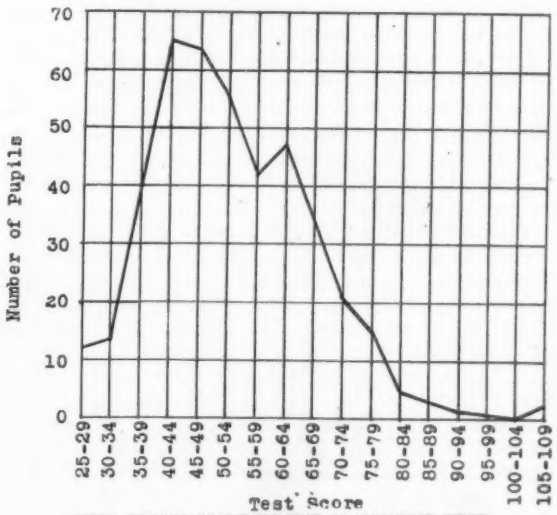


TEST SCORES MADE IN THE STENQUIST TEST NO. 1.

while the results from the MacQuarrie Test tended toward the lower quartile.

Conclusions

From the results obtained in this study it may be assumed that the tests either do not test mechanical ability or that a boy of low intelligence has as good a chance to succeed in mechanics as one of higher mentality. Because a boy has a low I.Q. it cannot be assumed that he will be entirely unsuccessful in certain phases of mechanical work. On the other hand a high I.Q. does not necessarily indicate a high type of mechanical ability. It is so evident that other factors enter in, such as interest, experience, muscular control, and manipulative ability, that success or failure in mechanical work



TEST SCORES MADE IN THE MacQUARRIE TEST.

cannot be predicted with the tests as the sole basis for judgment.

There is a great question in the minds of the writers of this article as to whether mechanical ability tests measure mechanical abilities and aptitudes or experiences only. Because of this doubt, a controlled experiment is to be set up in the Fresno Public Schools during the school year 1927-28. The extreme cases are to be grouped during the year and exposed to a great many mechanical experiences. The other academic experiences are to be as nearly alike as possible.

After going through the experiences for a year they will be retested and results compared with previous tests.

ORGANIZATION OF LESSONS

Sylvan A. Yager, Terre Haute, Ind.

AS CRITIC TEACHER of mechanical drawing and industrial arts in the Indiana State Normal Training School, I come in direct contact with prospective teachers, and am thus able to see and understand some of the problems that confront the new teacher. The new teacher will find it very necessary to spend quite a bit of time in the organization of lessons, since that is one of his greatest weaknesses.

Any subject in order to be taught well, must first be analyzed. That is, the teacher must carefully scrutinize his subject and determine its logical divisions. He must ascertain the things that will be least interesting to his class as well as those that will be most interesting. In other words, the teacher must know that there are certain things that the class will like, while certain other things will be disliked. The skillful teacher in organizing his subject for the term's work, should keep this in mind so that, insofar as possible the "sour will be mixed with the sweet." The results of such an organization will enable the teacher "to put across" his subject matter in the least possible time, and with the least expenditure of energy, because the interest and attention of the class will at all times be easily aroused and held.

The success of the teacher in any subject during the entire term, will, of course, be measured by his success from day to day. So again the skillful teacher will see to it that each bit of his subject that is brought before the class is organized in such a way that it will not only be interesting in itself, but that it will fit into his plan of organization of the work for the entire term. It is important for a teacher to know that if he has his work properly organized, he can readily adjust it, making it heavier or lighter, as the ability and capacity of his classes seem to demand.

Proper organization requires that each lesson be thoroughly organized, so that the teacher can drive directly toward the goal he has set up. Many classes may be visited where it is difficult to see any progress being made at all. The teacher apparently does not know where he is going nor what he wants to do or say next, and the class drifts first one way and then the other. Such conditions are quite common. They are always the result of poor organization or lack of organization.

The difficulties of the teacher will be minimized, if the class is started right. You have heard teachers say that they felt pretty sure of themselves if the first few lessons were a success. It seems that this is especially true in mechanical drawing. The progress of the classwork will depend largely on their interest, so one of the duties of the teacher is to see that the interest of the class does not slacken. Take orthographic projection, for example. In the organization of the course, orthographic projection should receive a place commensurate to its importance. Each assignment to be given to the class must then be organized in such a way that it will serve a specific purpose. That is, the completion of each assignment must bring the student a step nearer to the proper mastering of the subject, and it must be assumed that the class will thoroughly understand each assignment before the next one is taken up. If the assignments accomplish this, the progress made by the student will be steady and sure. To accomplish this, however, makes the organization of lessons in drawing a task which requires a good bit of thinking.

The following shows the organization of a plan which was worked out for a lesson in orthographic projection.

LESSON PLAN

Mechanical Drawing: First Year

December 4, 1927.
Teacher—Jack Jones.
Subject: Orthographic projection of rectangular block.
Type of Lesson: Related technical.
Class: First year (high school) mechanical drawing.
Teaching conditions: Class of twelve high-school students, who have had geometrical construction and who have a fair knowledge of how to make graphs.
Aim: 1. To teach the class to draw the representations of the faces of the block on the planes of projection.
2. To teach the class the relation of the different views of the block as represented on the planes of projection.
Line of approach: Development.

First Step. Preparation

Subject Matter	Procedure
First idea A photographer taking a picture.	1. Have you ever seen a photographer taking a picture? 2. Here are some views of pictures taken recently. Are all these pictures views of the same building? 3. What makes you think they are or are not?
Second idea Position of the photographer.	1. Have the student draw diagram on the blackboard representing the house, designating the different sides. 2. Just what position did the photographer take in order to get each of these pictures? 3. Indicate his positions on the board with the letters A, B, C, etc. 4. Where would you stand if you were going to take a picture of the house? 5. Why would you take that position instead of some other position? (Have several students answer the last two questions.) 6. How many views could you take of the house? 7. Where would you stand to get each view? 8. Then, how many views may we have of any building, house or object?
Third idea Planes or screens parallel to sides of house.	1. Imagine a transparent screen placed in front of this house. Imagine further that the screen is higher and wider than the house, and that it is parallel to the front side of the house. Suppose a line were drawn from each corner of the house to the photographer. 2. Would the lines pass through the screen? 3. Now suppose these lines from the corners of the house to the photographer were perpendicular to the house instead of running to the camera. 4. Would they still pass through the screen? 5. If the screen is parallel to the front of the house, what relation will these lines have to the screen? 6. What will be the relation of any number of lines drawn in the same manner: *a*) To the house?

b) To the screen?
c) To each other?

7. Suppose we connect the points of intersection of the corner lines with the screen, (the ones drawn perpendicular to the house) with a string, what sort of an outline would we have?
8. If the screen were moved away from the front side of the house, would the outline just formed with the string be changed?
9. Why would it remain the same?
10. Now who can summarize our discussion so far by telling the class how we would proceed to get an outline of the front (side) of the house on the imaginary screen?

Second Step. Transition Point
Presentation

First idea
The relation of the block to the house.

1. Now imagine that instead of house, we would use this small block of wood, 1 by 3 by 4 in. We are going to take pictures of each face on the screen just as we did with the front side of the house, and we will let this piece of chalk be the photographer.
2. Is the block in any way similar to the house?
3. In what way is it like the house?
4. How many sides has the block?

Second idea
Moving planes away from sides of block.

1. Now let us imagine the planes or screens which we used for the house as being around the block, in the same manner as they were around the house.
2. How are they with reference to the different sides of the block?
3. The block now is placed in the projection screen.
4. What sort of a figure do these screens form?
5. What do these screens show with reference to the views of the block?
6. How many now, can take the chalk and draw a picture of the front of the block on the screen? (Have a student do this.)
7. How many can draw a picture of each face or side of the block on the screen? (Have different students draw different views, till all views have been drawn.)

Third idea
Relation of the views as they are represented on the projection screen.

1. Now, since we have all views drawn, do you see any two views that look alike?
2. Which ones look alike?
3. Where are the ones that look alike with reference to each other?
4. What relation does the top view have with reference to the front view?
5. What relation does the side view have with reference to the front view?
6. At this point the teacher opens the projection screen and the students see an actual representation of all the views of the block and their relation to each other.
7. Any further discussion that is necessary will come here.

Third Step. Application

1. Here the teacher gives the class directions for locating the drawing on the plate, and the class proceeds with the work of actually making an orthographic projection of the block. The teacher aids the pupils by suggestive questions if necessary.

Fourth Step. Testing

1. This might come in the next lesson or it might not come for two or three months. Since this is the first lesson in orthographic projection, however, this last step would in most cases really lap into and become a part of the second lesson. It is a testing of the pupil's ability to make this drawing or a similar drawing without assistance.

The purpose of each of the four steps used in the lesson plan is easily seen as the lesson develops. To start with, the teacher had several different views of a prominent building and these were distributed among the members of the class. The step of preparation then was centered around these pictures and very little difficulty was encountered in getting the minds of the students centered on the new subject. By judicious questioning the lesson was brought within the field of the student's own experience, and thus a foundation was made for the second step. Here the teacher skillfully brings the class face to face with the new problem to be taken up. It is in this step (presentation) that the class gets their first idea of just what the teacher is driving at.

The third and fourth steps are explained in the lesson plan and their relation to the first two steps can be easily seen. I might add, though, that the third step (application) will give the teacher a chance to check up on his work. By that I mean the teacher can see by the progress which the class makes in handling the new lesson, whether his teaching has been successful or not.

It is not intended that the lesson plan should contain each and every question that a teacher might ask the class in teaching the lesson. The aim is merely to have the plan contain questions which cover the most important points.

Lesson plans organized in this way have the following advantages: First. They put a premium on a strong preparation. Too many teachers plunge the class into a new subject or a new lesson without first getting them ready for it. The skillful teacher will lay a lot of emphasis on the preparation step, in order that the class may have a foundation for the new things which are to come up in the presentation step. The preparation step serves as sort of a "shock absorber." It gives the teacher an opportunity to link his lesson up to the past experience of the members of the class. Second, it enables a teacher to check up on his job and see if he has really "put the thing across" or just merely wasted a lot of time. Quite often when a lesson apparently is unsuccessful, the teacher places the blame on the class. Even the best teachers sometimes fail, in their teaching efforts, and it is no disgrace to fail, but whenever a teacher does fail, he should not stop until he has found out exactly where the trouble lies. This is necessary in order that the same thing may not occur again. If the teacher does make a thorough analysis of the situation, he will find, in most cases, that the trouble lies with him and not with the class. It is only by analyzing and correcting his mistakes that an ambitious teacher is able to really draw profit from his daily experiences.

THE FARM SHOP.

An absence of power machinery. The farm workshop must to a large extent be without motive power.

SCHOOL PRINTING IN THE UNITED STATES

F. C. Lampe, Chicago, Illinois

(Concluded from August)

Teacher-Training Courses

The rapid increase in the number of vocational and manual-arts classes in printing, naturally led, during the past twenty years, to a demand for competent instructors. Most schools naturally turned to the trade and employed men with good commercial experience and general education. These men rarely possessed teaching experience, and they found in their new work that special training was essential to laying out courses of study and instructing large groups. Again other schools, not able to find competent men in the trade, turned to the normal schools and colleges for help. To meet the needs of the schools for printing teachers and to aid those already engaged in the work, a number of higher schools opened printing classes.

President S. J. Vaughn of the Colorado Women's College, Denver, who in 1910 was manual-training instructor in the Northern Illinois Teachers' College at DeKalb, Illinois, lays claim to be the first man to establish a teacher-training course in printing. He "suspects" that he was about the first man to put a complete printing outfit into a public school in this country; certainly in the Middle West. He bought the equipment for the Northern Illinois Teachers' College in 1910. About a year later he wrote the first treatise on printing for schools.

"It is a very gratifying thing to me," writes Mr. Vaughn in a letter to the author, "to know that after these sixteen years the subject of printing has gone into practically every important school system in America. I can scarcely claim that I foresaw this phenomenal spread of the subject, but I certainly did see the tremendous need for it." The class of 1927 conducted by Mr. Milo Oakland, the present instructor, included 26 young men prepared to teach printing.

The printing department of the Colorado State Teachers' College at Greeley was first organized in 1913. The shop was located in a corner of the basement of the administration building, with a small press and a few cases of type. At first there were only two or three students in the class. The classes have grown until now they are limited to 25 college students and 30 high-school students. A number of students is turned away every quarter because of insufficient accommodations.

The college printshop is used to teach the theory and technic of printing, and in addition it serves as a laboratory for practice teaching where the training classes observe both senior- and junior-high-school pupils. Many of the college students enrolled in the classes have been teachers in the public schools and seek additional training. Others are studying the subject before entering upon the profession, and still others take it because they wish to become supervisors of industrial arts and feel they should be familiar with the art of printing. President George Frazier holds that the main task of the college printshop is to teach printing as a great art and to create a desire for more artistic printing. In connection with the department, Ralph T. Bishop, the instructor, is forming the nucleus of a typographic library.

The Kansas State Teachers' College at Pittsburg, which now has one of the best school printshops west of the Mississippi, started its course in the summer of 1915. The first meager equipment has been added to from year to year. Mr. Lester A. Reppert, now director of apprentices in the Chicago School of Printing, was the first instructor.

Printing With a Different Objective

The printing department of the Carnegie Institute of Technology, Pittsburgh, Pa., was organized and began operations in the fall of 1913 as a part of the then School of Applied Industries. Dr. C. B. Connelley, as dean, sanctioned the organization of the work, and the first head of the department was Mr. Harry L. Gage.

The course was originally a three-year trade course. It was Mr. Gage's idea to make the work of college grade. In 1919 a four-year course was established, leading to the degree of Bachelor of Science in Printing. The course, as designed at present, prepares for executive positions in the industry and does not stress craftsmanship. There are two special courses, however, which emphasize craftsmanship, a two-year day course and a four-year evening course. The school met with success from the very beginning and the increase in enrollment has been steady. Sixty students were enrolled in the degree course in 1925. The department is well-equipped to carry on this kind of training.

About 35 years ago, Girard College, Philadelphia, introduced printing as a sort of amateur interest, according to President Cheesman A. Herrick. Mr. Charles M. Cooper was the first instructor. In 1914, printing became a distinct department of instruction in the institution and work was carried on in a shop equipped with foundry type and power presses. In 1919 the department was enlarged and an additional instructor was employed. The printshop does all the printing of the college.

TABLE OF CITIES IN WHICH PRINTING IS TAUGHT

Location of School — Kind of School	Year Started	Present Number of Schools
New Harmony, Indiana, Vocational	1826	...
Hanover, Indiana, Vocational	1829	...
Cincinnati (Lane Seminary), Vocational	1834	...
Clifton, Pa. (near Bristol), Vocational	1834	...
Waterville, Maine, Vocational	1836	...
Raleigh, N. C., Vocational	1857	...
Seattle, Washington, Vocational	1875	...
Faribault, Minn., Vocational	1876	...
Frederick, Maryland, Vocational	1878	...
Indianapolis, Indiana, Manual	1890	15
Philadelphia, Pa., College	1891	...
Chicago, Illinois, Manual	1896	53
Indianapolis, Indiana (U. T. A.), Vocational	1904	...
Rahway, N. J. (Reformatory), Vocational	1905	...
Philadelphia, Pa., Manual	1906	8
Gary, Indiana, Manual	1907	...
Cleveland, Ohio, Manual	1907	25
Chicago, Illinois (Lake Side Press), Private	1908	...
Canton, Illinois, Manual	1908	...
Indianapolis, Ind. (I. T. U.), Correspondence	1909	...
New York City, N. Y., Manual	1909	24
Boston, Mass., Manual	1909	16
Seattle, Washington, Manual	1909	...
Vancouver, Washington, Manual	1910	...
Jersey City, N. J., Manual	1910	3
DeKalb, Illinois, College	1910	...
Dayton, Ohio, Manual	1910	4
Newark, New Jersey, Vocational	1911	11
Atlantic City, N. J., Manual	1912	...
Atlanta, Georgia, Manual	1912	5
Washington, D. C., Manual	1913	13
Pittsburgh, Pa., College	1913	...
Greeley, Colorado, College	1913	...
Chicago, Ill. (School of Printing), Private	1913	...
Columbus, Ohio, Manual	1914	3
Albany, New York, Manual	1914	...
Toledo, Ohio, Manual	1915	2
Richmond, Va., Manual	1915	...
Pittsburg, Kansas, College	1915	...
Cincinnati, Ohio, Manual	1915	12
Sioux Falls, S. Dak., Manual	1916	...
San Diego, Calif., Manual	1917	5
Burlington, Vt., Manual	1917	...
Spokane, Washington, Manual	1918	...
Los Angeles, Calif., Manual	1918	40
Brookings, S. Dak., College	1918	...
Salt Lake City, Utah, Manual	1921	...
Fort Worth, Texas, Private	1921	...
Wahpeton, N. Dak., College	1922	...
Gooding, Idaho, Manual	1922	...
Wilmington, Del., Manual	1924	...

Certainly printing has had a most modest beginning in American schools. Its value as a vocational subject leading to a most interesting and satisfying trade is recognized; its cultural and general educational value in a program of shop courses is accepted by a wider circle each year. It is the hope of the writer that the publication of this material will help fix the record of the early history of printing in American schools or will at least arouse sufficient interest to cause educators to come forth with facts which have been omitted.

KEEPING ACCOUNT OF THE MATERIALS USED IN THE SCHOOL SHOP

J. W. Bollinger, Tulsa, Oklahoma

KEEPING A RECORD of materials used in a school shop efficiently is a problem every industrial-arts teacher must face. That it is a problem is seen from the fact that so many and such different practices are followed. The writer has found at least a dozen varying procedures; no doubt there are more.

In a few school systems in this country the board of education pays for all of the materials used in the industrial-arts shops. Whenever the instructor is fortunate enough to teach in such a school, the matter of accounts is no problem at all, as only the quantity of material purchased during the year need be kept record of. The disadvantage of this practice from the instructor's point of view is that there is a tendency on the part of the pupils to waste too much material through carelessness and a lack of appreciation of the worth of the items furnished.

In quite a number of instances the board of education pays a part of the cost of materials; for example, such incidental items as screws, nails, sandpaper, and finishes in the woodshop, and bolts, emery cloth, lubricating oil, and wiping rags in the metal shop are provided free of cost to the students. This lifts quite a burden from the shoulders of the instructor, and does make it nice for the students. It is questionable, however, whether it is good business to follow out this policy. If the pupil wanted to do the work at home, or later wanted to go into the business of manufacturing these articles, he would have to pay for the incidentals himself, of course. Therefore, it would seem reasonable that the pupil should stand the cost of the incidentals in school. If this be true, then there is the question of how the instructor is going to keep track of these items, and how he is going to charge the pupils for them. It is almost out of the question to try to charge, let us say, one cent for six ten-penny nails, two cents for sandpaper, one-half cent for stain to cover one-half square foot, one cent for shellac, and three cents for varnish, when the projects all consist of small pieces, and when the teacher has twenty to twenty-four pupils in the class, and is trying to teach something at the same time. One way out is to add to the price of the wood a certain percentage to take care of waste and incidentals. Thus, if a square foot of the wood costs twenty cents, add to it twenty-five per cent, and charge the pupil twenty-five cents for the wood. Proceed in a similar manner in the other shops, for tin plate, insulated wire, bar iron, or whatever the staple materials are. Another way out is to add a certain percentage to the entire cost of the lumber used in the article, after the article has been completed. If the right percentage is hit upon, either of these methods would seem quite fair and would be rather easy to administer. If, then, at the end of the semester, the instructor finds that he has not yet paid for all the waste and incidentals, he may still add to each pupil's account a flat charge of five, ten, or fifteen cents each, and come out whole.

Some schools are unfortunate in that the board of education will not undertake to buy any of the materials necessary, so that pupils are compelled to go to the stores and purchase themselves whatever they require. If the instructor were to depend on pupils to bring materials themselves, there would be no end of difficulty and delay, with the attendant disciplinary problems and loss of interest on the part of the students. In a case of this kind, one of two things generally happens. The first is that the instructor will have to pool all his collections and make the purchase for the whole group himself. This brings in the difficulty of attempting to determine in advance exactly what will be done during the semester. The other possibility is that the shop activities will be but very limited in scope.

In still other schools the procedure is to charge each pupil a flat rate; that is, each pupil pays to the school a certain amount of money regardless of what he makes in the shop. In some cases this is a good plan, notably in some printing courses, where the jobs can be pretty well determined in advance, and where most of the expense goes to cover depreciation of equipment, losses in linotype metal, etc. But in a shop where there is considerable difference in the quantity or value of the work turned out by the individual members of the class, it would be unfair and also poor business to charge all the pupils the same amount. Usually pupils resent this practice.

One instructor with whom the writer is acquainted requires his pupils to pay cash for each item as it is issued. Thus, when a boy wants a sheet of drawing paper, he pays the instructor one cent or two cents, as the case may be; ten minutes later a sheet of squared paper may be needed and he pays the instructor again one cent cash for one sheet of squared paper. If a sheet is spoiled, he may perhaps borrow from the instructor until tomorrow. Figure it out yourself. The system does work, however.

By far the most common practice is for the board of education to lay in a supply of materials that the instructor believes will be needed for the ensuing year, and then to require each pupil to make an initial cash deposit at the beginning of the semester, against which to charge the materials needed by the pupil in the shop. That this is the efficient way to do is now quite generally conceded.

Another instructor with whom the writer is acquainted has a large chart for each one of his woodshop classes. This he posts on the door of his lumber rooms. As the pupil secures a piece of wood, the instructor consults a board-foot table and a price chart near by, figures out the cost, and places the amount opposite the pupil's name on the sheet. No doubt this system works. There is no indication, however, for what the piece of wood was used. Then, too, there must be another record of how much the pupil paid the instructor, and also there must be a separate place provided for recording grades of the pupil's accomplishment.

A variation of this method is used by still another man, who makes use of a sort of progress chart for each one of his classes. The names of the individual pupils are placed down one side of the chart, and the names of the projects across the top. As the pupil starts the project, a certain mark is made in the space opposite the pupil's name and under the name of the particular project. When this article is finished, a grade is put down in the same space. For any additional materials that had to be furnished, another kind of mark is put on the progress chart. Next to the pupil's name is marked what amount the pupil has deposited with the instructor; at the end of the semester the sum of the material used is balanced against the amount on deposit. With this chart, it is possible to tell at a glance whether any member of the class has paid his deposit or not, which projects he has made and what he is working on now, and also what his grade is on each problem. About the only disadvantage of this method is that the chart is necessarily large and clumsy, and gets pretty well thumbed

up and hard to read by the end of the semester.

In one school system all shopmen are required to keep a loose-leaf notebook, in which one page is assigned to each pupil. On this page it is possible to draw columns for tabulating the entire record of the pupil. Thus, right after the pupil's name would be a space for recording the amount of money deposited. Then would come the name of the first project worked on, with perhaps an itemized list of the pieces required to make the article. There is room also for listing incidentals, the cost of each part, a grade on the accomplishment, the total of what had been expended, and the amount that has been refunded. If these pages are arranged alphabetically according to classes, and the place where each class' records begin is indicated by a tab on the outside of the book, this method of keeping records will be found quite practical.

A variation of the foregoing procedure is to use some printed 4 by 6 in. two-ply white cards, instead of the loose-leaf notebook.

Some instructors try to use a regular classbook for the information intended for the aforementioned loose-leaf notebook, or the cards. In addition they try to keep the attendance in the same book. Obviously this is not a very satisfactory procedure. It has been found to be quite necessary to keep a separate book for recording attendance, and attendance only.

Several unique methods of procedure which may be of interest will be discussed next. The supervisor in a certain school system provides each instructor with pads of printed blanks, on which to write the name of the pupil, and a description of the piece of material issued to the pupil. Every time a piece of material is issued, one of these printed slips is made out, either by the teacher, or by the pupil and O. K.'d by the teacher. These slips are then placed in a box until the close of school, when the instructor transfers the items from the printed slips to a set of two-ply cards, of which he has one for each pupil. The chief objection to this method is that the same job has to be done twice.

Another supervisor furnishes his men with what he calls "coupon books." These books are printed in the high-school printshop, and contain fifty cents in little coupons of one-, two-, and five-cent denominations. Each coupon is perforated, so that it can be torn out readily. When a pupil receives some material, he pays for it with a coupon of the proper amount. The objection to this method is that the pupils have to keep track of their own coupon books, which are frequently lost or stolen.

To overcome this objection, the coupon books have given place to a kind of "meal ticket." Around the edge of a card are printed numbers to represent one-, two-, and five-cent amounts; the pupil's name, school, etc., appeared in the center of the card. When the material is issued to the pupil, the instructor punches out an amount equal to the value of the stock issued. At the end of the semester, the amount still unpunched is refunded to the pupil. These cards are kept in packs by the instructor, and have been found to be satisfactory for the purpose for which they are intended.

In conclusion, several general observations may be in order. First, if the pupil pays an initial deposit, he should be given a regular receipt, showing that he has paid his deposit. The instructor should have a carbon copy or stub showing the same information. Second, the pupil should know the prices of the materials he is using; he should be able to figure up what each completed article will cost; and finally, he should be told what the same article would have cost had he purchased it at a store, and the reasons for this price. The pupil should be able at any time to find out just how his account stands. At the close of the semester, the pupil should sign a refund receipt, showing that he received a certain amount in refund from the instructor.

At the end of the year the pupils and the instructor should have a definite idea of how they stand. There should be a written record of all the items handled in the instructor's shop during the year. This would include an inventory of the supplies left over from the year before, and a list of all items received at the school during the current year. An excellent way to keep track of items that come in is to have a book for this purpose, and to make the entries into this book on the same day that the material is received. A statement should be prepared showing:

Amount of supplies on hand from the previous year.
Amount of supplies received during the year.
Amount of materials purchased by the instructor (if this is permitted by the supervisor).
Amount of materials used by the pupils.
Amount of materials used for new equipment.
Amount of materials for next year's inventory.

The two sides of the sheet should balance; that is, the amount of money collected from the students should be equal to the cost of the materials used during the semester. This report should appear in triplicate; one copy for the superintendent's office, one for the principal's office, and one copy for the permanent files in the shop.

SELLING MANUAL ARTS THROUGH PRACTICAL HOME MECHANICS IN THE JUNIOR HIGH SCHOOL

E. W. Manzer, Wisconsin High School, Madison, Wisconsin

MAKING NEW THINGS out of old is the pastime of may fathers and mothers of junior-high-school boys. In some instances it is because of necessity that old things are renovated and made-over, while in other cases it is only using leisure time in an enjoyable and profitable way. Why then should not the junior-high-school boy be taught to make over articles that have been cast-off and relegated to the attic?

A visit to the home of a master of home mechanics will, in most instances, reveal some article that was made from a discarded piece of furniture or purchased from a second-hand store. This article may be an old German helmet doing duty as a flower basket, or part of an old hanging lamp that gracefully holds an air fern. The old iron statue that formerly adorned the top of a living-room stove, might be supporting an ash tray. In the back yard one might also find a family of happy wrens living in an old straw hat that was thoughtfully transformed into a cozy home. It might be that this work was done in the basement workshop or in the manual-arts shop at the junior high school, but, wherever it was done, it was *practical home mechanics.*

The general shop can be vitalized and made more dynamic by the introduction of problems that have utilitarian value, problems that will help to motivate the work through direct interest. It is agreed, and generally accepted, that every boy should know how to fix a leaky faucet, replace a broken pane of glass, repair a faulty flat-iron cord, but from the evidence presented in books, magazine articles, and suggested courses of study, it is quite evident that many practical problems are not finding their way into the classrooms. Suppose a boy should bring to the shop an old board that he had found in the basement of his home. His father, being interested in enriching the landscape of the home, is very anxious to have a rose

LAMPS AND FERN STAND MADE FROM MATERIALS SALVAGED FROM THE ATTIC.

trellis, but because of lack of tools, he cannot build one at home. It is a good home-mechanics job, so Henry says, "Dad, I can make a rose trellis in my home-mechanics class. Mr. Jones told us to bring problems to the shop. May I make it for you?" What happens when Harry brings the rose trellis home? The shopwork is *sold* to the dad, and he in turn sells it to his friends at the office or to his neighbor who comes over to visit him when the trellis is being set in the ground. During the conversation the neighbor learns of the *practical home-mechanics* work that is being done in the school shop and he also learns about the shop. Good advertising of this sort will make it easier for the instructor or supervisor to get new or better equipment.

Selling the possibilities of the department of manual arts is one of the duties in which every instructor should become proficient. The material product of the shop is his advertising medium, and through it many people learn just what is being done for the boys. They cannot see the changes that are wrought in the boys' character, ideals, or habits, but these factors can be brought to a focus when parents visit the shop.

The electric lamps, shown in the figure, are samples of practical manual arts. They have cost very little to the boy, who, through the experience of making something worth while out of something that was relegated to the attic or scrap heap, learns to be thrifty. The fern stand, for example, cost about 30 cents. The lamps, without the shades, cost about 50 cents to be made into things of beauty for the livingroom or for the boy's study room. The shade frames came from the dime store and the material for the shades came from old party dresses that were out of date. The mother of the boy, in making the shade, sets up another bond of cooperation in the home. When the lamp is finished, Mrs. Smith makes an early morning call. She sees the beautiful result of *practical home mechanics* and immediately wants to know if John can make one for her. The best advertising comes from this side of the house for it is recognized that news travels when women get hold of it. What better advertising can an instructor of manual arts have than satisfied parents who can enthusiastically cite instances of this kind at the P. T. A. meetings? Just as soon as the work of the shop is sold to the parents of the community it means better shops, better equipment, and more pupils taking the work. Frequently a shop can be opened in the evening so that parents can come in as a night-school class. Experience in a class of this kind has demonstrated the value of selling the work of the shop to the community through the medium of *practical home mechanics*.

ARE YOU A DERBY WINNER?

Laurence Parker, Kansas State Teachers' College, Pittsburg, Kansas

A great horserace was run the other day. Thousands of people watched it. Months had been spent preparing the horses to run in it. Many of the spectators put up real money to back their ability to pick the winner. Few won and there was a reason. Not one reason, really, but many.

One horse was poorly trained, broke in his stride and failed to win. He came of a fine racing family but he failed to even place.

Another horse came from a great line of racing stock but he was not in condition, yet to my inexperienced eye he seemed so. He soon lagged far behind after a brilliant start.

One horse in that race was the product of the best racing strains. His father and mother were horses famous for speed and endurance. He had been trained carefully and was in good condition. He did not win the race for he was not truly interested in getting out in front and staying there. He was contented to stay back with the crowd.

The dark horse that won the race had not been a famous horse until the moment of winning. His ancestry had aroused no enthusiasm among the betting fraternity. His appearance was not that of a winner—but he won the race. He won because he had been trained carefully, handled expertly, was in the right condition—and greatest of all, had a fighting heart.

He got off to a poor start but he never quit; he did his best and that was just good enough to win the race.

Teachers of all sorts and manual-training teachers especially show up in much the same fashion at their work as the horses we saw in the great race.

There are teachers who never seem to have learned the truly important things which would make them great teachers. Oh, yes, their Alma Mater gave them courses of training but these folks bluffed and loafed their way through. They are teachers after a fashion, of course, but never winners for they break in their stride. They are regular customers of teachers' agencies.

There are the well-trained and truly gifted teachers who will not deny themselves the things which destroy their efficiency. Good fellows, but soft and out of condition. One or two years on a job and failing to get increases, they change jobs.

There are, too, honor students who are not interested enough in the noble calling that they have chosen to push out in front and win.

But the "dark horse" teachers—God bless them! They are willing to pay the price. They do not depend upon anything but hard work to win. They are the ones with a fighting heart that keeps them spurred to greater effort. They are the ones who spend their evenings and Saturdays in preparation, summers in further training and their lives in order to make each "crop" of boys better prepared for life than was the last one.

Fortunate indeed that there are many "dark horses" in our schools, for they are the ones who help to make these schools the great success that they are. It is a great race that is being run every day of our school year. God bless the "dark horses" striding down the stretch to victory.

INDUSTRIAL-ARTS MAGAZINE

E. J. Lake S. J. Vaughn
Editors

LIFE DEMANDS MORE THAN INTELLIGENCE

It is difficult to test native endowments. Psychologists have made a little headway in making tests of intelligence, or in discovering the character of some of its manifestations. With such progress many people have imagined that when one's intelligence quotient has been determined more or less accurately, that the whole of one's life and needs has been found. It is nearer the truth to say that such a step is but a hazy and uncertain beginning.

There are so many, many character elements not determined by the intelligence, or any other test, except the test of life in the living!

A comparatively few places in the world demand highly superior intelligence. The overwhelming majority of the deeds and the needs of the world could be done and met by people of only good normal intelligence, given other character elements of sufficient intensity.

Speculation has been going on among scientists and other scholars as to what percentage of the brain power of the world is either unused or diverted into useless channels. It is even being investigated whether there are any individuals who find demands in their lives and in their regular pursuits for any considerable proportion of their mental capacity.

In an unprecedented manner, the world is demanding now moral character, honesty, self-control, loyalty to personal and business ideals, and a number of other things in addition to normal intelligence.

While inheritance may and probably does play an important part in the giving or the withholding of such character elements, nevertheless many, if not all, of such elements may be acquired, at least in some degree. They are acquired and developed through constant practice and repetition of such acts and thoughts as bring into conscious play the desirable elements and characteristics.

Everything else has been tried. Every conceivable "ism" has had its place in recent years in the curricula and the practices of our schools. The Editors of the MAGAZINE are looking hopefully forward to the time when some of the old-fashioned notions will come back into our education. Among these things will come a new-old emphasis on a certain reasonable amount of information and drill in real situations on these acquirable and cultivable character elements that are so essential to the proper performance of every task and to the rounding out of any sort of a satisfactory and successful life.

THE CRAFTSMAN AND THE INDUSTRIES

One of the subjects to be discussed at the International Congress on art education in Prague next August is "The Arts and Crafts Situation and its Relation to Industry."

In our art educational process craftsmanship has been neglected. We have directed our efforts consistently toward appreciation rather than toward skillful execution.

The need of craftsmen in the industries has been a subject of much concern from time to time, but the opinion seems to prevail that the artist craftsman who may design beautiful and useful commodities for quantity production needs training in the workshop under master workmen as well as in the studio under art instruction.

Well-designed and well-constructed machine-made goods have become a great modern convenience and necessity. A market has rapidly developed for good machine-made goods but it has not and will not replace the demand for distinctive hand-made things of fine craftsmanship. We are inclined to believe that the craftsman has no real quarrel with the machine. The artist must expect to create his own market. He could only satisfy a limited market at best and that market must be created and satisfied by his own individual production. Art education will serve both the industrial and the individual producer best by the development of interest in beauty and the demand for it which results from a developed taste and judgment.

LAMENTATIONS

We have just read in the morning paper a report on the meeting of the N. E. A. at Seattle in which a prominent educator who should be able to speak with authority, laments the tardy progress of education in America as compared with industrial and scientific accomplishment.

We are reminded of the proud father of a sturdy son who was happiest when his six-foot progeny was able to put him on his back in a friendly tussle.

This speaker seems to imagine that industry and science are operating independently of education.

We consider education as the progenitor and promoter of industry and science.

Of course education has other interests than the development of industry and science but the distinctive success of America in both industry and science is the direct result of educational development in America.

Can one imagine either industry or science advancing independently of effective education?

The ambition and ability to do great things in every worthy line of human effort is fostered and promoted by the schools.

The self-styled "self-made" individual is now discredited by the public and the impression is general that if a person is going to amount to much, he or she must get at least a common-school education.

Industry and science have produced remarkably evident results in the way of improved conditions of living.

Education is concerned with the manner of living. It is difficult to estimate the value of school training because the conditions of living are undergoing rapid changes, but just so long as the schools command the respect and confidence of public opinion which they now command, the teacher has little reason for lamentation.

TEACHERS AND PUBLIC OPINION

In this day and age the teacher many times is not given the social rating he or she is entitled to. The average social group seldom opens its arms in welcome and when it does the meeting is apt to be stiff and formal. These statements are often heard and have some justification.

If this condition exists in your community, ask yourself the question, "Is it my own fault?" Do you become so engrossed in your own particular little sphere of work that all your thoughts are devoted to school and children? This procedure results in a distorted viewpoint and promotes a self-centered, eccentric human who will naturally be frowned upon by all society. He might be likened unto a balloon, blown up in one spot, just shrieking its lopsidedness. The same amount of air might have resulted in a well-rounded balloon if the air had been equally distributed. The same amount of social contact, equally distributed through the expenditure of the same energy would also result in a well-rounded development, for the average teacher. The ones who take advantage of social organizations and clubs composed of people not in the teaching profession are getting a well-rounded development, while the self-centered ones become warped without knowing it. What a wonderful thing a mirror of life would be! Burns says:

"O wad some power the giftie gi'e us
To see oorsel' as ithers see us!"

We need less teacher social organizations in each locality and more mixing of professional and business representatives, where everything but shop talk would be on the program. If we wish our viewpoint to remain uncramped and unbiased; our vision of life undimmed by the idealism of fiction and masterpieces of literature, we must associate more with life as it is actually lived today round about us. There is no better way of equipping ourselves to solve the daily problems of the classroom than by the training to see another's viewpoint. The club signifies no superiority on the part of any one, two or class of members and the word of no one person is law in itself. The reverse, to a greater or less extent, is true in a schoolroom or shop. To appreciate another's viewpoint, in a tolerant way, is the result of much practice and self-control. The club, when attended in the proper spirit will assist in the acquisition of this much needed trait.

The foregoing applies principally to teachers as a group and, even though many shop teachers come into direct contact with industry, clubs, etc., it cannot be said that vocational teachers are entirely free from association with teachers as a steady diet, talking shop continually. We need more contacts outside of the school shop or classroom if we are to keep from becoming eccentric or from being blown out of proportion in one spot. Joining clubs, social or civic, will add much to our store of useful information on local conditions, will equip us mentally to enjoy our work, as well as tend to break down any social barrier which appears to exist between teachers and the public. This joining of clubs, however, must be regulated with temperance, as must all other things, for the "spread-eagle" method of joining clubs is just as harmful as being content with what you can learn by yourself.

KEEPING UP WITH "LINDY"

Lindbergh flew across to Paris and set the world on fire with enthusiasm and hero worship. The newspapers gave him and his exploit more space than they probably ever gave Theodore Roosevelt.

There is no objection to this fulsome praise. Hats off to Lindbergh; he deserves it. There is a place for the pathfinder and the trailblazer. Not everyone can be a trailblazer. Think of a thousand men flying across the Atlantic for the first time all at once!

But what's the use of a pathfinder, unless multitudes of others follow the path? That's what "Lindy" did. He had the courage to do what proved to be easily within the power of a thousand men to do. Dr. Frank speaks of the "contagion of courage." Multitudes of men are now looking toward trans-Atlantic air travel who a month ago thought of it as a perfectly visionary and impossible idea, especially for this generation.

So, again, honor to the pathfinder! But what about those who shall follow paths laid out? What a drab life it sometimes seems to those of us who must dig away at the commonplace task! No publicity; no public acclaim; no meeting and dining with royalty; no rides through the throng-pressed avenues; nothing but today's little task, to be repeated tomorrow, and to be done over again the next day! And yet it is the *path-followers* who keep the world going, provide the daily bread, keep the marts of trade open and active, solve the problems of community betterment, and give balance and solidity and character to life.

The path-followers have their rewards, too. It is they who meet day by day the youth of the land and help them through the stresses and difficulties of everyday life. Read again the story of "The Other Wise Man" who turned aside from a great adventure to minister to the suffering and the distressed along the way. And by the magic of justice and an all-wise Providence, the commonplace tasks along the way became the very avenue to the rich rewards of the great adventure.

Let those who teach in an inconspicuous place and in a quiet and self-forgetful way, and those who labor at other unheralded tasks, and those who bear the burdens of others weaker than themselves, and all who work quietly and unostentatiously at the necessary drudgery of the world—let all such take heart anew and realize that for one who blazes a path ten million must *follow* the path in the daily and sometimes monotonous effort to bring the world to a better day.

TO THE INSTRUCTOR WHO SUCCEEDS HIMSELF

The summer vacation is drawing to a close. You have probably spent a part of it attending summer school, working at your trade, following some remunerative occupation, or you have spent it traveling, camping, touring, or just resting. No matter what you have done, at any rate your energy and courage for the coming school year have been revived.

Your classes last year were quite successful. Your principal was well satisfied with your work and said as much. You naturally felt gratified. But now the question arises, can last year's success be duplicated; how can the new year be made as successful as the old? Will it be safe to use last year's outline of instruction, and last year's lessons just as they were? Were there not some lessons that were not quite as clear as they might have been, some drawings that needed additional dimensions or notes?

Is this not a good time to attend to these details? And by the way—have you thought about the objectives of your course? It is so easy to start out with very definite objectives, and then as time goes on, lose sight of them entirely. Therefore, ask yourself the question: "Just why am I teaching my particular subject? What am I attempting to do?" After you have definitely reviewed your objectives, check each lesson which you used last year, and see whether its aims coincides with your course objectives. And while we are on the subject of objectives, have you clearly in mind just what your school is trying to do for the students? Do your course objectives agree with those of the school?

Having definitely settled the question of objectives, the next question is "How can the course be improved?" Remember that progress means betterment. That your course was satisfactory last year does not mean that it cannot be improved. Nothing can remain at a standstill. Your work either improves or deteriorates. Look therefore, for points that can be strengthened. Seek for new methods of arousing the student's interest, better ways of illustrating your explanations, a more striking manner of presenting your demonstrations, a way to make your illustrative material more interesting, as a matter of fact, of making your entire organization more effective.

As the time for the first recitation draws near, you will of course, see that your shop, tools and equipment, and the materials are all in first-class condition. Plan so that your first school session starts with precision and snap. Plan to meet your students with a smile, to have them do most of the reciting, to have work ready which will appeal to their interest and test their mettle.

Be prepared also for disappointments. Do not be surprised if your classes have been enlarged, if your requisitions for new tools have not been passed, if your students react only half-heartedly to your efforts, and if some of them seem to have forgotten all they ever knew. Remember you must be resourceful enough to teach even under adverse conditions. Remember too, that it takes your enthusiasm and your energy to overcome the mental inertia of the students, and lastly remember that only by exerting yourself to the utmost will this year's crop of students be as successful as last year's.

The highest and most profitable learning is the knowledge of ourselves; to have a low opinion of our own merits and to think highly of others is an evidence of wisdom.—*Thomas à Kempis.*

CUTLERY FOR THE SCHOOL FORGE SHOP

Jay F. Knowlton, Supervisor of Boys' Industrial Work, Hibbing, Minn.

(Fifth Article)

Paring Knives

Paring knives are instruments without which the housewife's work would be hopeless. She purchases them for a small sum and expects to receive a high-class instrument. This instrument is not only used for paring vegetables, but for scrapping pans and kettles and for sharpening pencils. There are so many poor knives of this class on the market that it is no wonder that the housewife thinks all knives are alike.

Some desire a paring knife with a very thin blade; others desire a heavy back with a thin point. The back of a thin blade, as a rule, is very hard on the hand if used for any length of time, but is more easily sharpened by the user. The knife with the thick blade is more pleasant to use and is less flexible. Drawings of the two types of paring knives are shown.

Figure 4 shows the thin blade type and needs no explanation. It is easily made and requires no forging. Heavy sheet aluminum makes a good material for handles as the average wood does not have sufficient strength to hold rivets for so small a handle. This knife will remove the potato covering for a long time without being sharpened. The thin blade has the desired sharp quality and has many friends.

Figure 5 shows a paring knife made from thick stock and having a larger handle. The stock is 3/16 in. thick by ⅞ in. wide, forged to the desired shape, and finished with the file and emery cloth. After the blank is forged to shape, it is annealed, shaped with a coarse file, draw filed with a fine one, and then polished with different grades of emery cloth. The tempering is the same as in the case of the butcher knives and the polishing is with fine emery cloth. The knife is now ready for the handle.

The handle is made from a square piece of wood cut to the desired length. In the center of the end a 3/16-in. hole is drilled to a depth equal to the length of the steel tang. This is the pilot hole for the steel tang which is burned into its place. The polished blade is wrapped in a wet cloth and the tip of the tang placed in the fire until a red heat is obtained, when it is forced into the handle about one-half to three-quarters of the length of the tang. It is then removed, heated once more, and driven home by hammering on the handle, with the blade point resting on a hard wood block. The blade should be watched to be certain that the colors do not appear. Should the blade show signs of becoming hot, the cloth may be dampened a little which will retard the heat. The wood handle may be dressed to shape, sanded, and polished, and the blade given a finish.

This knife has been used in the writer's classes for a long time under three names. First, it makes an excellent skinning knife for a trapper who must travel light. Second, it makes a fine sloyd knife for use in shop woodwork. Third, it makes a good paring knife. It may be used in the seventh grade with good results, and as a filing exercise it has no equal. The stock used costs a small amount, and the scraps of the woodshop make fine handles. Its popularity has caused it to be named "boy-scout special."

Figure 5A represents a blade of the same general shape having a handle of different material and shape. It was designed for a small hunting knife, with a more elaborate handle than that shown in Figure No. 5. The material for the center part of the handle may be deer horn, cow horn, leather, birch bark, black walnut, or any number of these combined.

Butcher and Kitchen Knives

Figures 6, 7, 8, 9, 10 represent kitchen knives, the designs fitting nearly every need of the housewife and farmer. The forging and polishing of these has been previously ex-

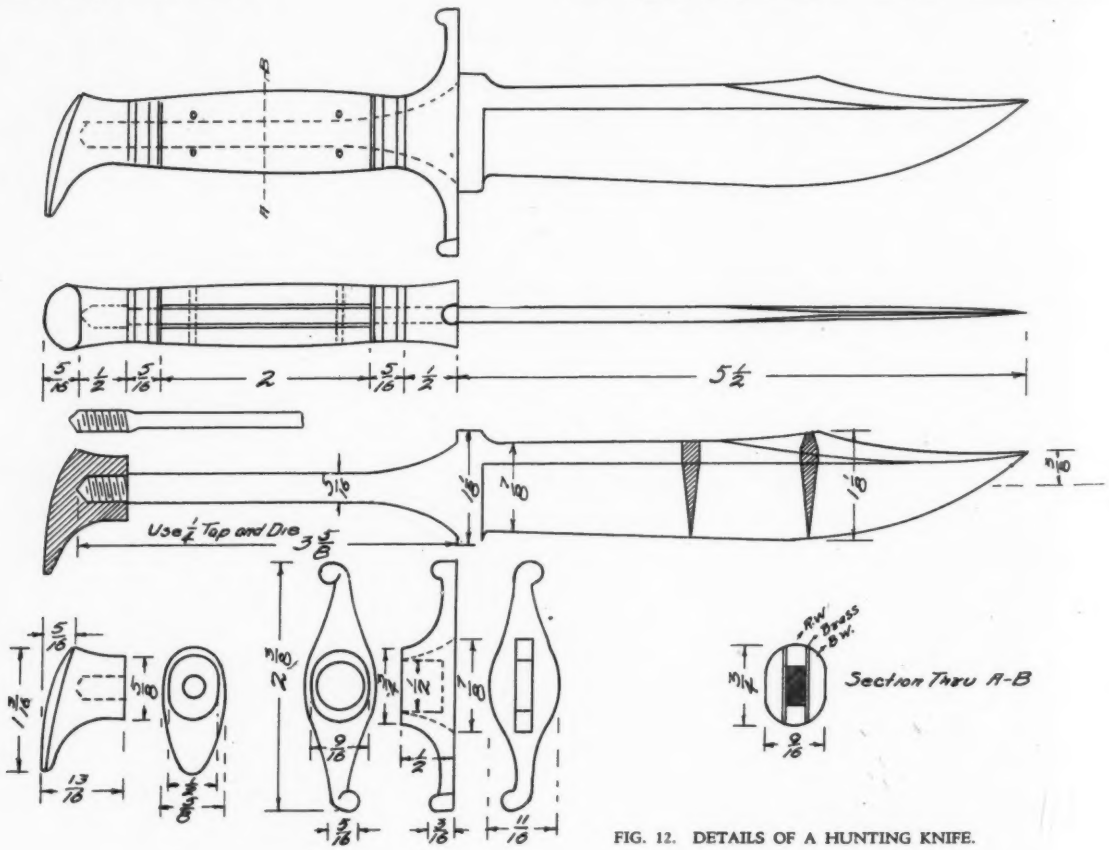


FIG. 12. DETAILS OF A HUNTING KNIFE.

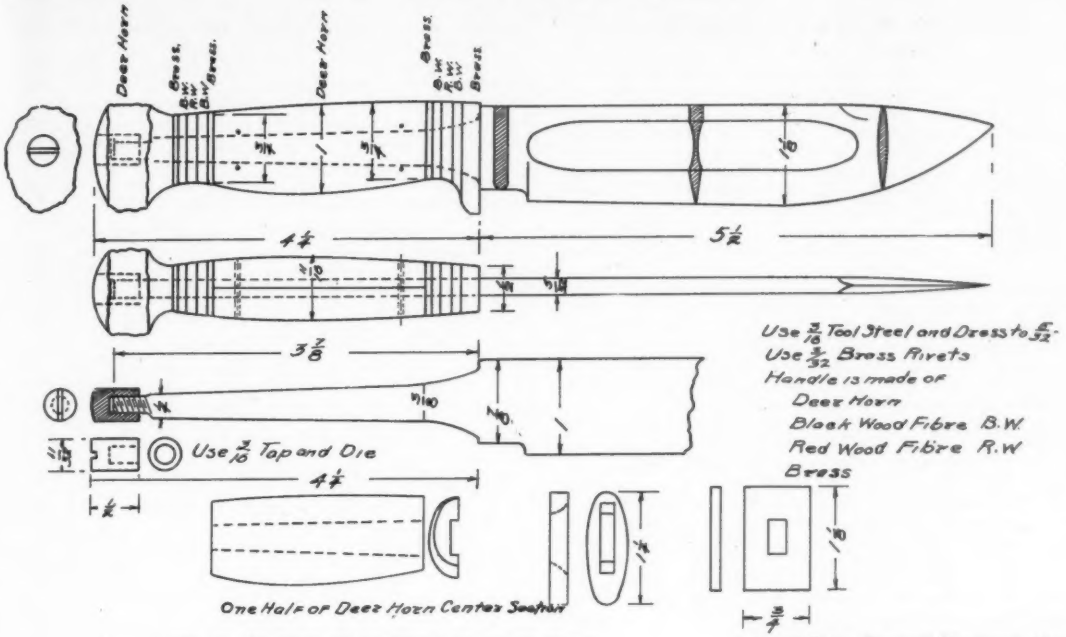


FIG. 13. DETAILS OF ANOTHER HUNTING KNIFE.

plained while the drawings are self-explanatory and need no comment.

Hunting Knives

Hunting knives create more interest in a forging course than almost any other problem. The blades may be worked into interesting and beautiful shapes and the handles may be made interesting and artistic. The entire knife may be made for a small sum and the artistic efforts of the student know no limit. These knives require a great amount of time; there is a limit where the educational value becomes a question. The problems are of value when judiciously placed in a forging course. The process of forging is the same as shown in Figure 5A.

Hunting knives may be classified under several different heads. They will be described in the order of the skill required in construction.

The first knife in Figure 11 is a simple hunting knife for the hunter who wants to carry a seven-inch blade. It is more of a general all-around camp knife where a Ford is available for transportation. The handle is of the simplest form and easily made. The hilt was used in the past to keep the hand from sliding over the blade when in conflict. Some form of guard will be found on nearly every hunting knife and this one goes back to the hilt of the old sword and dagger. The guard on the ordinary knife is purely ornamental and if of any size is impractical.

The knife is made from a good grade of steel ⅛ in. or 5/32 in. in thickness and ¾ in. to 1 in. in width. The blade is forged to the required thickness from the guard to the point. This must be done as described under butcher knives. In drawing out the edge the blade will take on a curve away from the edge, so it is necessary to give it a reverse curve. The edge should be drawn out with the hand hammer at an orange red, and smoothed with the set hammer or flatter. The corner shown in the blade near the guard should be fullered and swaged to shape with the set hammer. The opposite corner will be formed over the edge of the anvil. The change in width of the blade to 13/16 in. should be fullered.

The tang should now be forged, keeping the proper taper and thickness, after which the blade is marked to shape and trimmed with the hot cutter. It is annealed and filed to shape, care being taken to retain its definite lines as shown. If these become rounded the pleasing shape is lost. The blade may be polished with emery cloth, the holes in the handle drilled, and the blade tempered and polished.

The guard may be made of brass, silver, or aluminum. In cutting the opening to receive the tang, care must be used to get just the right size, so it will be necessary to drive the guard a little to set it in its proper position. If this is properly done, the guard will retain its position; it can be soldered on the handle side if desired.

The handle can be made from aluminum, wood fiber, or wood. Wood fiber is a little heavy and wood is not very durable. Black walnut gives a very good contrast.

This knife is a general camp knife and can be used in cutting bread, opening tin cans, chopping the wood, and even for a tent stake if necessary.

This knife, Figure No. 12, represents a good type of hunting knife to be carried in the woods. It has a very pleasing combination of the sticking and skinning shapes. The change from the blade to the tang is retained to as full a shape as possible for strength. If a square corner is used here, it is liable to break.

The guard and butt are of pleasing design and give an opportunity for the use of the foundry. The guard is a little extreme but not enough to endanger the design of the knife. The butt piece is held on the tang by means of the screw thread. As steel is difficult on which to cut threads, it is best to weld a small piece of soft iron to the tip of the tang. This is not difficult as a good union can be obtained with the flat scarf and a little welding compound used at a low welding heat.

The handle is made of black and redwood fiber and brass. The two sides can be successfully made from deer horn. The handle is assembled rough, dressed to shape, and polished with fine emery cloth. A handle of different material may be used if desired, for nearly any material will work to advantage in this design.

Figure 13 represents a common pattern on the market and makes a knife having a rather heavy blade. It is strong, serviceable, and is presented for the pleasing design of the handle. The blade and handle need no explanation. The grooves in the blade can be made with the use of an emery wheel turned to the shape desired, if a machine is not available.

(To be Continued)

A NEW PROBLEM IN BOOK ENDS

C. Anthony Van Kammen

As the Christmas season approaches, the manual-training boys are desirous of making something that may serve as a gift to some member of the family or to a friend. Gifts that are artistic as well as serviceable are always appreciated. The book ends offered here have fully satisfied the demand for a worth-while gift for the past two years in junior-high-school woodworking classes. On an average, the problem can be completed in ten sixty-minute periods. It offers an excellent opportunity for practice in contour and surface enrichment, and also involves the use of the band saw and circular saw. For the latter, the cutting of the molding introduces a special sawing problem.

Each boy is required to make a full scale drawing of the book end (see Fig. 7) and at least two good designs for contour and for surface enrichment. The latter design must be so drawn that it may be cut out of cardboard with carving gouges and chisels and glued to the front surface of the book ends, thus giving the appearance of having been carved from the wood or built up with plastic material such as gesso. See Figure 5. Oilette postcard pictures are glued in the panels after being cut and fitted and give all the appearance of oil paintings. Oilette picture postcards may be purchased at any good art store for ten cents each. They are published by Raphael Tuck and Sons, London, England.

It is suggested that the manual-training teacher cooperate with the art teacher in the production of these book ends. The designs may be developed in the artroom. Cutting, fitting, shellacking, application of stucco or gesso and sanding of parts should be the problem for the woodshop. After the foregoing operations, the finishing may be done in the artroom. This involves gilting, toning or producing the oxidized effect, coloring of the panels, white shellacking the picture for protection and antiquing with rottenstone.

The stock for the book ends is 6/4-in. gumwood. White pine or basswood may also be used. Presupposing the shop to be equipped with machinery, the stock may readily be reduced to 5½ in. x 7⅛ in. x 1¼ in. pieces by the student who will obtain from the lumber rack a piece of rough 6/4-in. stock 12 in. long and at least 7¼ in. wide. If stock is not available of proper width the necessity for facing and jointing the edges of the pieces and gluing them together is evident and forms an additional experience for the boy. With the circular saw properly guarded while the moldings are being made, each boy may be permitted to run his piece over the saw the necessary number of times to cut it to shape. If the instructor thinks it advisable, he can run off a quantity of long molding in the presence of the class. This can then be cut up to size as needed.

Producing the Molding

Figure 1 shows how the 1 in. x ⅞ in. molding sticks are run over the jointer to make the desired chamfer before the molding can be rounded out. The fence should be set at an angle of about 55 deg. that the line AB will be parallel with the table top of the

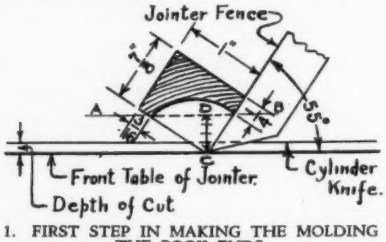


FIG. 1. FIRST STEP IN MAKING THE MOLDING FOR THE BOOK ENDS.

jointer. The distance CD is ½ in. If then, the depth of the cut is ⅛ in., the molding may be roughed out to size in four cuts. See that the narrow edge of the molding is held firmly against the jointer fence the first two cuts or until a good bearing surface on the table is attained.

The rough moldings are now ready to be rounded out on the circular saw. Joint and face two pieces of wood that are long enough to reach across the table of the saw at an angle of 72 deg. as shown in Figure 2, and fasten them to the table with hand screws. The pieces should be about 3 in. wide and ⅞ in. thick. By placing a piece of molding with the shape of the section drawn on an end, behind the saw and sighting from point C, it will be noticed at once whether or not the guides have been properly cut. Figure 3 shows how the molding and saw projecting above the saw table will appear from point C. In Figure 2, A and B represent the ends of the two guide strips. As the saw, when turned up to its highest point for the cut, is projecting above the table only $\frac{3}{16}$ in., and as it is guarded by the two guide strips, the student can make the cuts quite safely if he uses a push stick. Do not attempt to make the concave cut in one operation. Set the saw to cut a depth of $\frac{3}{32}$ in., and cut all the pieces. Then lower the saw table to make the second cut $\frac{3}{16}$ in. Pass the wood over the saw slowly. Sand smooth. A 14-in. circular saw was used with the foregoing angle of cut.

Cut a paper pattern showing the contour of the book ends. Thumb tack this to the 7⅛ in. x 5½ in. x 1¼ in. end pieces and draw around the same. Cut out the profile on the band saw, and finish with file and sandpaper. Cut the molding to the exact length, 7⅛ in., across the base. Cope out the ends. This may be done by butting one piece against the back face of the other, at each end of the molding as shown in Figure 4 A and B. Cope out the wood with a sloyd knife or a coping saw.

Cardboard Used for Surface Enrichment.

With a very sharp pencil trace around the contour of the book ends on a piece of cardboard of the correct size. Mounting board used by the art department for mounting drawings is quite satis-

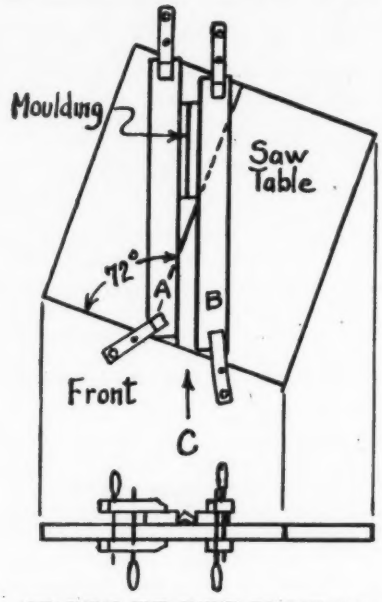


FIG. 2. ATTACHING THE GUIDES TO THE SAW TABLE.

factory. Trace the design on the cardboard. Make sure that the pattern traced has the same contour as the book ends. Very often in band sawing and filing, the book-end contour is changed from the original design, and the pattern must be changed slightly to correspond. Thumb tack the cardboard firmly to a smooth piece of wood

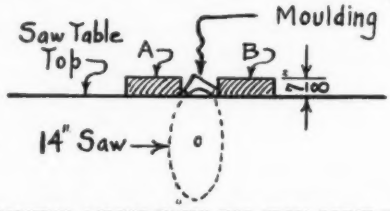


FIG. 3. SIGHTING ACROSS TABLE TOP FROM POINT "C" FIG. 2.

and with carving gouges and chisels cut out the parts as desired. After the design is cut out give the cardboard two or three coats of orange shellac on both sides. This is to make the cardboard firm and to make a suitable base for the stucco or gesso composition which is to be painted upon it with a brush. The book ends should also be given two coats of shellac at the same time. When these are dry, shellac the face of the book end which is to receive the cardboard. While it is still wet, fasten the cardboard to the book ends with ⅜-in. or ½-in. brads. Clamp the two ends together, face to face, with two sheets of paper between them. The paper prevents the two pieces of cardboard from sticking together. When dry, sandpaper smooth.

The molding may be nailed to the book ends before or after the cardboard is fastened in place. If before, fasten the molding with hot glue and nails and then shellac. This necessitates cutting the cardboard to fit around the molding. When the molding is placed over the cardboard, a thick coat of shellac is put on the molding face which is to be nailed to the book end. The molding and book end is held in the vise while nailing. Drive the nail heads flush with the surface of the wood. Sandpaper the entire surface lightly and give it another coat of shellac.

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THE INDUSTRIAL-ARTS MAGAZINE,
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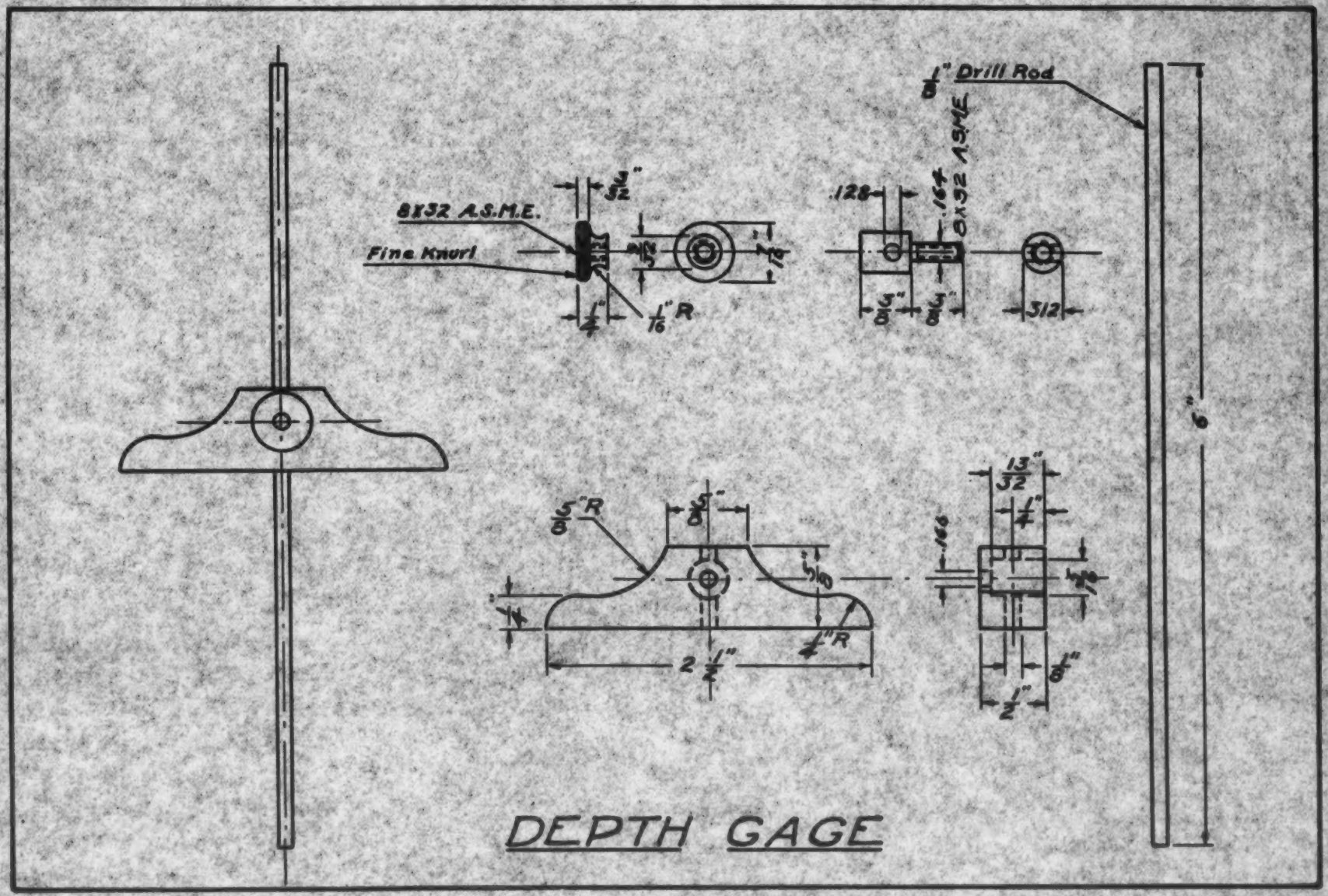

DEPTH GAGE

For Description See Page 348.

Designed by Arthur F. Ahr, Woodlawn, Pa.

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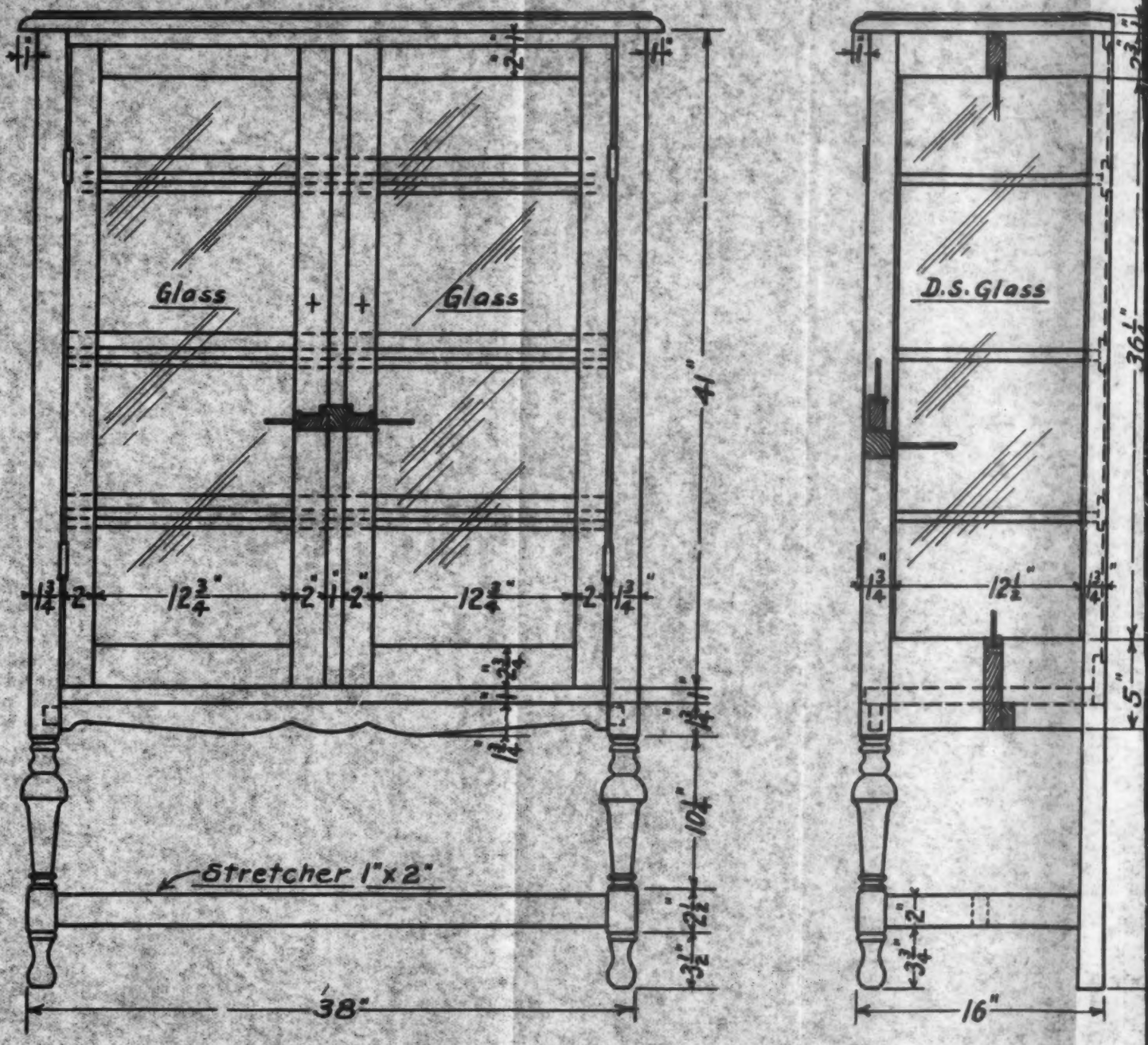
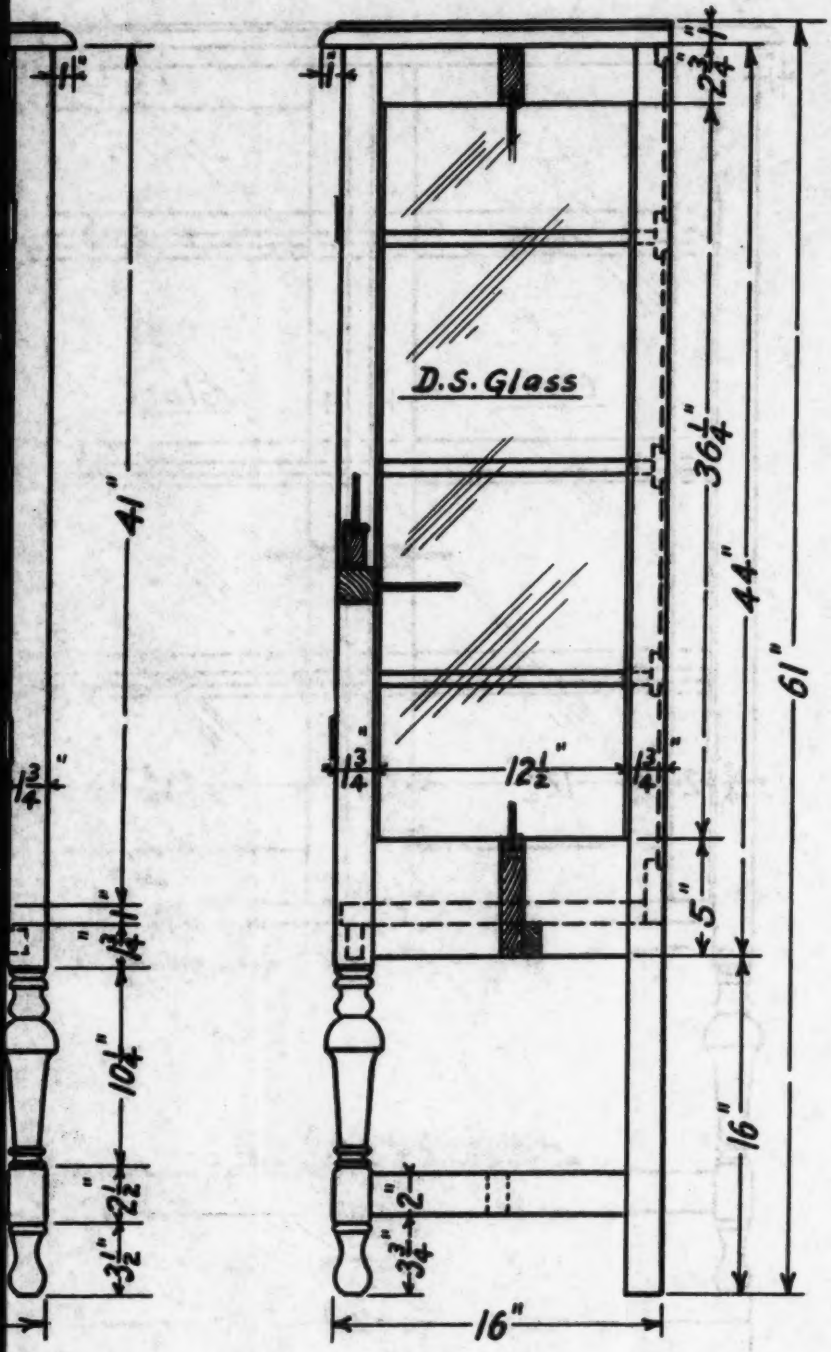
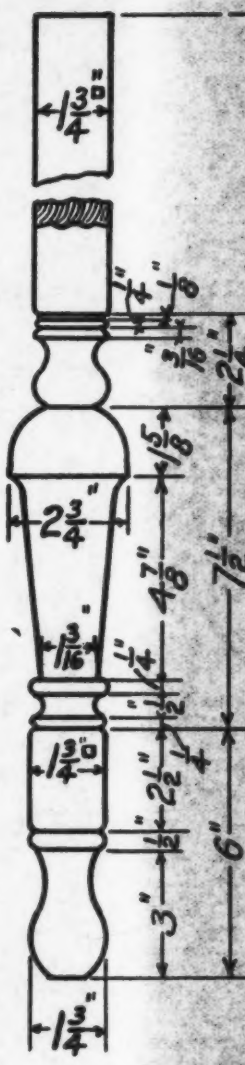


CHINA CABINET

Designed by C. C. Sindale, New Brunswick, N. J.

All joints not
are mortise an
Stock not dim
7/8", except shelve
back panels 1/4" s





HINA CABINET

Designed by C. C. Sinclair, New Brunswick, N. J.

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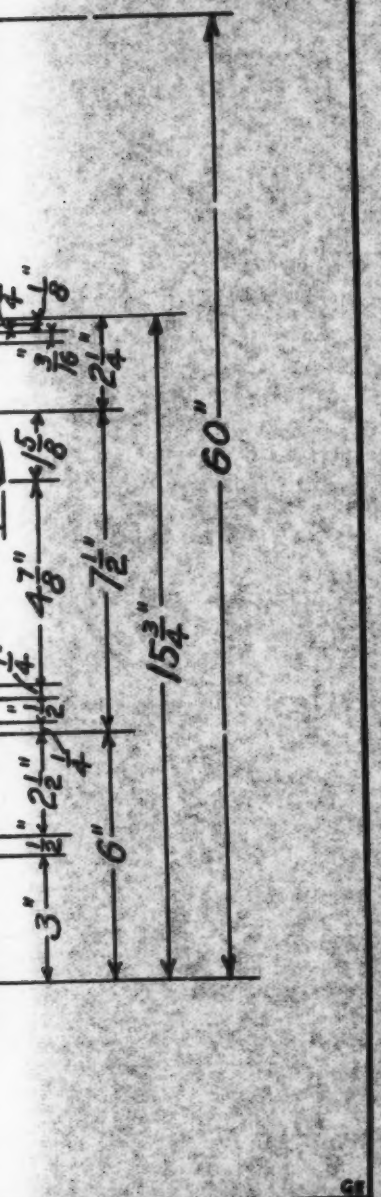
t dimensioned
helves ½", and
els ¼" stock.



THE INDUSTRIAL ARTS MAGAZINE,
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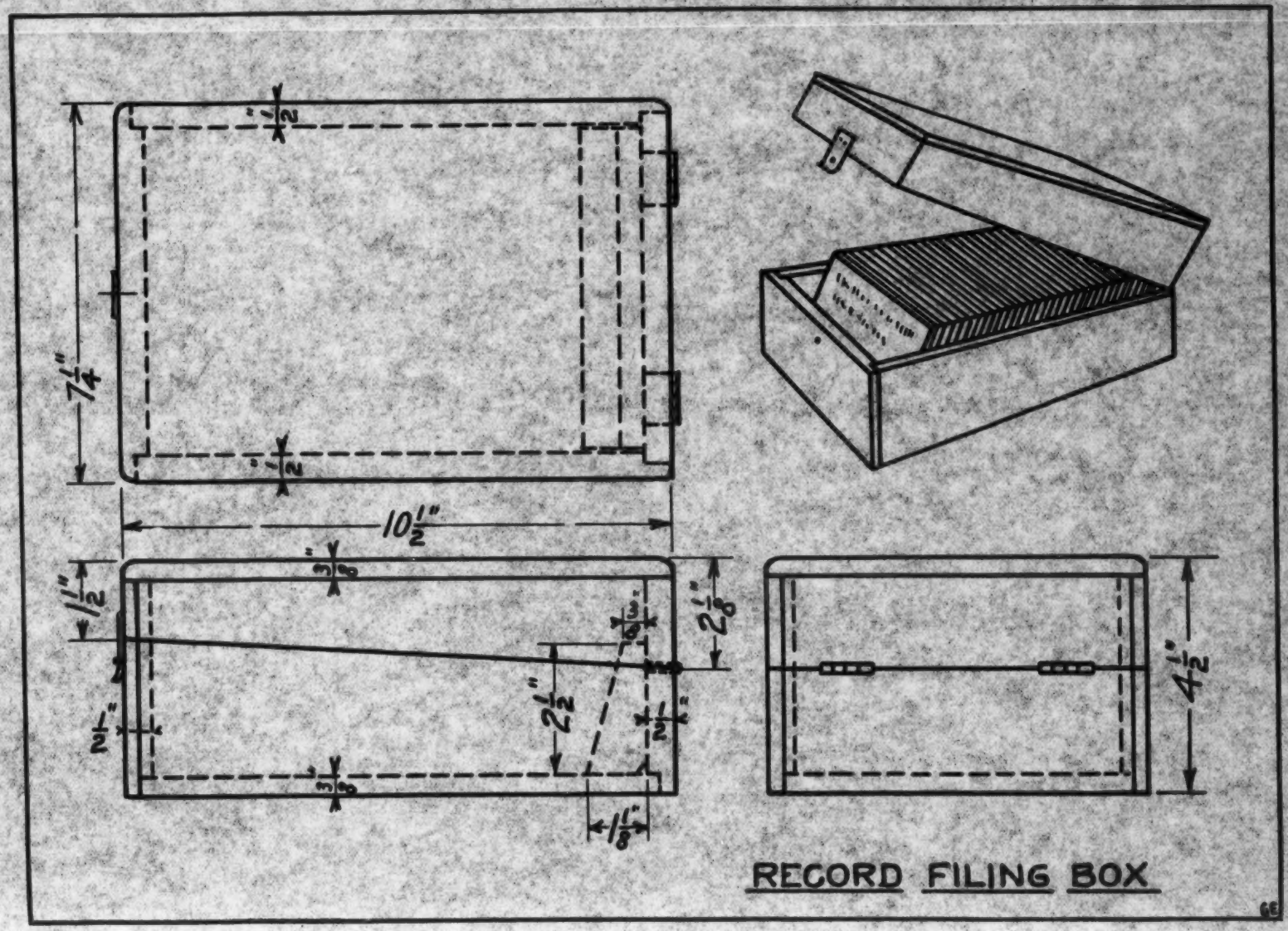


RECORD FILING BOX

Designed by C. A. Kunou, Supervisor of Manual Training, Los Angeles, Calif.

Finishing the Book Ends

Mix a quantity of thick orange shellac and powdered chalk into a paste. This gessolike material should be just thin enough to flow from the end of a brush. With a small brush, this mixture, which can be called stucco, is painted over all of the cardboard design, With a ½-in. bristle brush paint a thin layer of stucco over the entire surface of the book ends, with the exception of the cardboard design previously coated and stipple the surface until the stucco sets and has

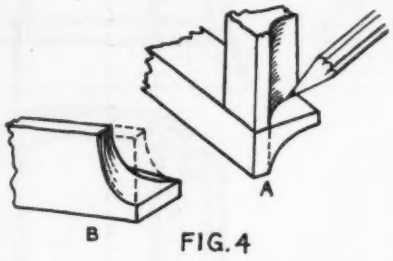


FIG. 4. COPING OUT THE ENDS OF THE MOLDING.

an even pebbled effect. When dry, sand off the sharp high spots. Give the work a coat of thin shellac to prepare the surface for the gold paint. Use only a good grade of pale-gold bronze. A small quantity of varnish in the bronzing liquid will set the gold so it will not come off during the next operation. Give the gilt plenty of time to dry before toning or producing the oxidized effect. The colors used for this purpose will depend upon the color effect desired. The art department can experiment with Van Dyke brown, burnt umber, Indian red mixed with Prussian blue, or values of green. Much will depend upon the pictures used in the panels. A quantity of the desired color is mixed with the paint which may be applied with a piece of waste. As the color starts to dry slightly, wipe off most of the paint, allowing the depressed places of the rough surface to retain some of the color. The high spots will be wiped quite clean showing the gold paint high lighted. As soon as the toning is dry, the picture post cards, which have been cut to fit are glued into the panels. Before gluing, the shellac must be scraped away, of course; otherwise the pictures will scale off. With a coat of white shellac on the back

FIG. 6. A FINISHED PAIR OF BOOK ENDS.

of the cards, and a coat inside the panels, very satisfactory results have been attained by pressing the picture in place while the shellac was tacky. Be sure that no part of the surface has been allowed to dry too long or the picture will chip loose or form air pockets underneath. When for any reason the pictures do not fit snugly in the panels a little stucco can be used to fill the opening and the spot painted with proper oil colors to match the spot on the picture. After the pictures have set and dried, give them a coat of white shellac to seal them in place and to protect them against moisture.

The small rhythmic spaces around the picture panels are to be colored with values found in the colored post cards. Rhythm of color may be obtained by painting the bottom spaces darker and blending or stepping to the lighter color as the top of the book end is neared. Harmony of color is obtained by toning all of the colors with some of the other colors in the color scheme. For example: Tone the red with a small quantity of its complement green, green with its com-

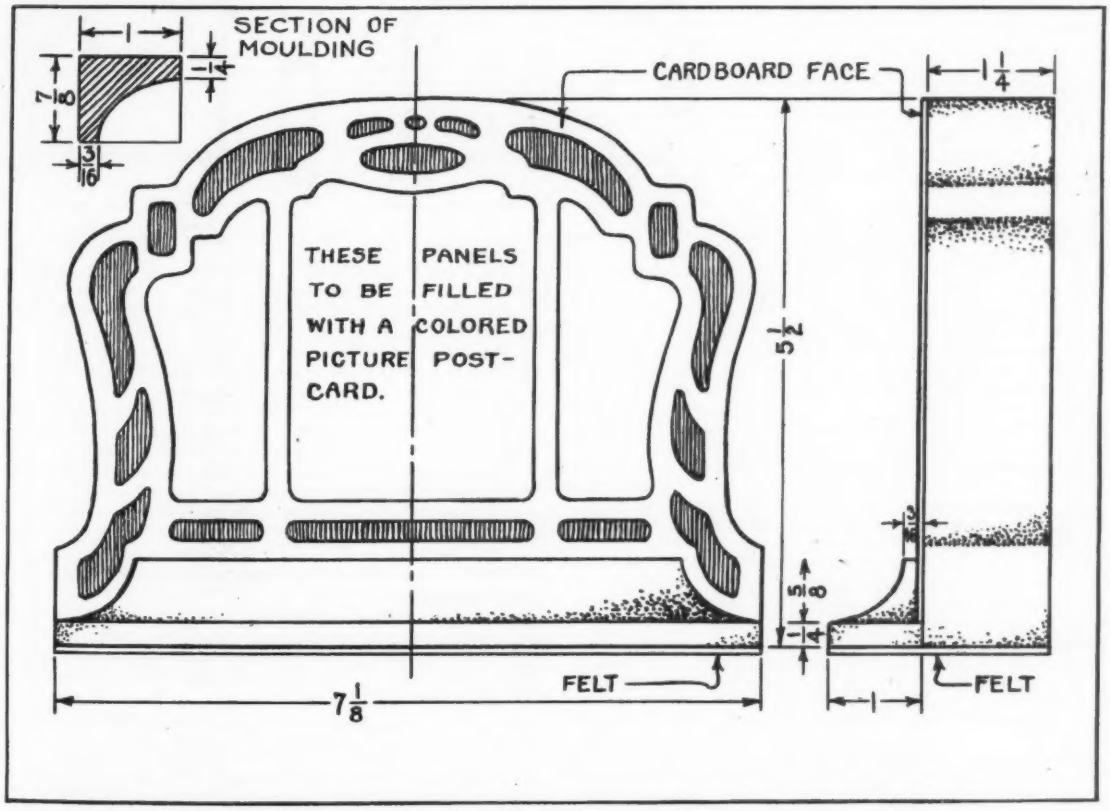


FIG. 5. BOOK ENDS WITH SURFACE ENRICHMENT APPLIED.

plement red, yellow with violet, etc. This process will gray all the values slightly. Too great a quantity of any color added to the other, however, must be avoided or a muddy color will be the result. A small quantity of flake white added to all the colors used will also help to harmonize the values.

The effect of age is obtained by applying a coat of rottenstone mixed in water to which a small quantity of glue has been added. Wipe off with clean waste and a sufficient amount of the dust will have adhered to produce the antique effect. Figure 5 shows a number of designs as worked out by the student workmen in the author's classes. Figure 6 is a photograph of a finished pair of book ends.

AIMS AND PRINCIPLES FOR AN ARTISAN COURSE

Reinhold Forkel, Instructor in Crafts and Woodworking at the School of Industrial Arts, Trenton, N. J.

We are giving too much thought today to production. The atmosphere of cheap commercialism is permeating the classroom and the school shop. We are losing sight of refined workmanship. Good technic and artistic feeling which so characterized the expertness of the artisan of the past, is slowly but surely slipping away. Quantity, not quality, appears to be the goal.

Surely, it is high time for directors and instructors of the arts and crafts as a whole to note the trend of the times and remedy the faults before it is too late. The present method of teaching lacks foundation. However, before this can be made a reality, a number of essential things must be considered. These essentials have been summed up under the following headings: Principle, design, handwork, instruction, material, and present methods.

Principle—First of all, an instructor must be capable of judging what is good workmanship. He must examine methods current in the shop, and set up a quality of crafts that is more associated with design and architecture.

Design—The instructor must treat the design as an essential part of the workmanship. In the past, much of the art closely connected with the industry was rarely considered. There was very little to be seen in design, and when applied it was displeasing. Most of our mechanics of the past lacked in this essential.

It is in the widest sense impossible to detach design and architecture from the crafts. There may be some pieces constructed very crudely and yet have artistic touch, but if all traces of design have disappeared a piece cannot be classed or considered under crafts.

We must give more considerations to freehand and perspective drawing which is now so sadly neglected in our schools. Too much time is devoted to mechanical drawing. If half the drawing time were devoted to freehand drawing, the student would gain and profit more by it. One who is able to do the former is certainly able to do the latter after a brief instruction on the use of the T-square, angle, and ruling pen. On the other hand, one skilled in mechanical drawing is very seldom able to produce a freehand drawing.

We must learn to sketch objects, to make good designs, well proportioned, and with an eye for construction and fitness for utility. Draw moldings, cornices and pilasters and, if possible, sketch and apply period ornaments. Train the hand and the mind to produce better drawings which mean better work.

Workmanship when separated from design will decay and ornamentation taken away from good construction will fall into affectations. Many objects constructed rightly, but faulty in design, are spoiled in appearance and decrease in value on the market.

Handwork—In training an artisan we must go back to the handwork, learn how to handle tools and apply our design. We must to some extent put aside our modern machinery. Accurate handwork must be featured and a thorough knowledge of this essential must be secured before production or quantity should be taken into consideration.

Instruction—In giving instruction, the teacher must secure the interest of the student in the work, no matter if it be of simple nature or of better grade. Accurate work shows the advantages and disadvantages in operation. The student must appreciate the work and realize the value of the instruction.

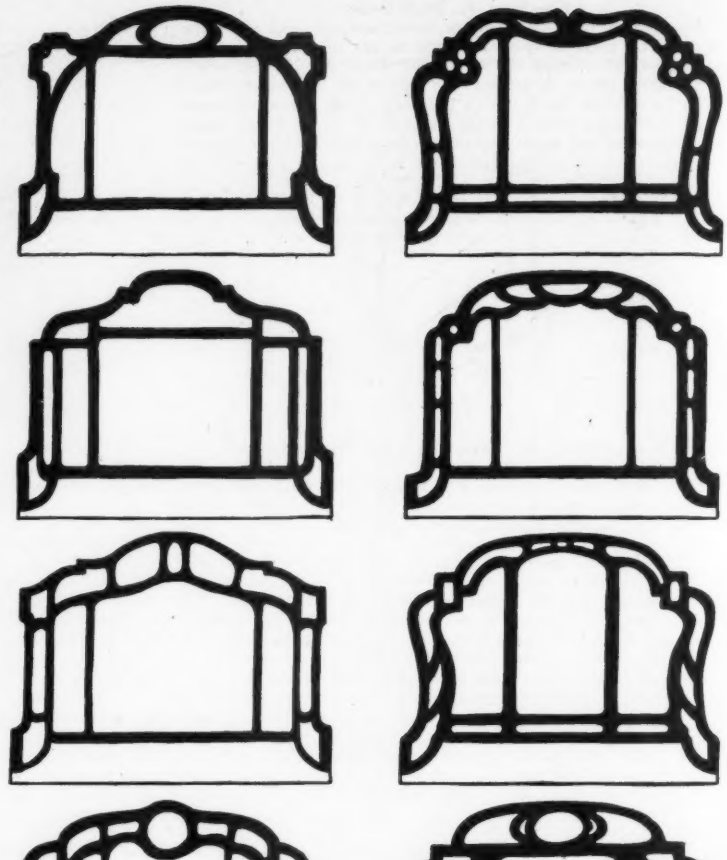


FIG. 7. SUGGESTIONS FOR CONTOUR OF BOOK ENDS.

An instructor should from time to time show his fitness and ability as an instructor, by producing a piece of work, as a practical demonstration of good workmanship. By doing so, the students will respect him as a teacher and as their master in the crafts.

Material—We have at hand vast stores of commercial articles that will serve as models. The museums are filled with the works of old masters and craftsmen in period furniture, pottery, and wrought iron. Our libraries have fine books dealing with the various arts and crafts, which can be used to advantage for teaching purposes. All of these are of great assistance to both the instructor and the student.

Present Methods—We will not advance by our present methods unless more time is devoted to design, to freehand drawing, and perspective drawing, thus blending the handwork and the thought in such industrial arts as we propose to deal with.

Just at the present time, our industries are in a great unrest, due to a lack of good artisans to produce good work with which to face our competitors.

Conclusion—There are numbers of young ambitious men with talent which could be brought to the productive crafts, and there is every probability that nearly every one would make a good craftsman in one of the many branches of the industrial arts, if the proper help and training were forthcoming.

MAKING THE SNAP GAUGE

C. C. Hermann, Moline, Ill.

A system of limit gauges known as snap gauges is in common use in industry. The limit gauge, as its name implies, is intended to avoid the necessity of working to unnecessary accuracy in interchangeable production. The degree of precision may be established

at will, but the selection will determine to a considerable extent the cost of the finished article. As the degree of precision goes closer to the ultimate limit of accuracy the cost goes up, therefore, this element is more or less limited by the competition encountered in marketing the product.

How Limits Are Set

A reasonable method of setting limits is to determine just how inaccurate the work can be produced and still be found to retain the necessary high degree of workmanship characteristic of its class of production. These limits once determined are valuable and must be preserved at all hazards. Through their determination various parts of a given machine may be produced in different shops, yet, when the parts are brought together, they will be found to assemble workably in the complete machine.

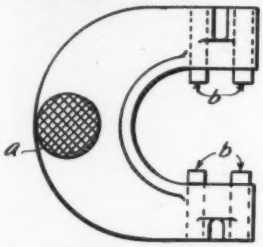


FIG. 1. GAUGE WITH ADJUSTABLE POINTS.

FIG. 2. GAUGE WITH FIXED POINTS.

It is the aim of every manufacturer to produce his work with limits just as wide as possible to keep the cost of production down, and yet have his workmanship comparable with that of his competitor. If a competitor produces a similar product with great accuracy, every manufacturer in the given field must likewise adopt a closer standard of limits. The increased cost of the product must be absorbed by the consumer or offset by increased efficiencies in manufacture.

By adoption of this definition of limits, we automatically recognize that a work standard has been set. That a piece of work passed by the gauges will be just right and that any accuracy greater than that prescribed by the gauging system would be too good, and involve unnecessary expense in its production. The next step then would be to provide gauges in order to speed up production of the pieces which would, each and every one, pass inspection on this basis. The workman provided with a micrometer will be found to bear toward the limit of accuracy more and more and costs will mount higher and higher or he will miss the mark too wide resulting in much spoiled work. Experience teaches that the best procedure is to provide the workman with a system of permanent gauges which will eliminate the human element in the measurement. It only becomes necessary then for the workman to proceed with the various operations until the gauge informs him that he has produced the element within the necessary limits without knowing what the actual measurement is.

The foregoing discussion shows the interrelation between the cost of production and the range which exists between the limits of accuracy in the gauges.

Difference Between the Snap-Gauge System and Other Gauging Systems

There is a great difference between the snap-gauge and the plug-and-ring-gauge system. The plug-and-ring-gauge system not only gauges the diameter of the given shaft or hole in which it fits, but it gauges the truth of the circumference of the shaft or hole. The snap gauge, on the other hand, will test the diameter of the part providing the gauge points are diametrically opposite each other, and the circumference only provided the gauge is passed over the shaft at every diametrically opposite point. Since, however, the production of the shaft is by means of cutters working concentrically with the central axis of the shaft, it is usually taken for granted that a perfect cylindrical piece of work has been produced and that the gauging at a single point circumferentially is sufficient evidence that the work is correct.

The snap gauge is also adapted for the production, within practical limits, of plain parallel surfaces or diametrically opposite points on work that is other than round or cylindrical.

Effect of Temperatures

Steel and iron like other substances are changeable. Differences of temperature produce differences in dimensions, therefore, we find that the heat of the fingers or hand in holding the gauge results in a change in the dimensions of the gauge. Winter and summer temperatures as well as room temperatures bring about corresponding changes. Referring to the gauge shown in Figure 1, we note the incorporation of an insulated pad *a* intended to insulate the gauge proper from the heat of the human body and thus overcome this variable. The change in gauge dimensions due to changes in atmospheric temperatures is taken care of by the adoption of the adjustable hardened screws, *bb*, placed in the gauge points. These adjustable points also enable the gauge to be set for dimensions within certain limits.

In Figure 2 is shown a gauge having permanent points *aa*, and intended for use where the variable due to temperature changes can be ignored. Gauges such as shown in Figure 2 are also machined for their maximum accuracy under given temperature conditions and this temperature in degrees Fahrenheit stamped on the gauge. In order to obtain the same degree of accuracy, the gauge must be used in a room wherein the temperature is the same as that stamped on the gauge. This latter stipulation is generally taken into consideration in the use of all gauges having very close limits of accuracy.

Limits once established must be maintained and in order to maintain the limit there must be some standard of comparison. Such comparison is termed checking. Checking instruments consist of measuring machines, micrometers, calipers, and for the very finest and most accurate checking gauging blocks are used. It will be found in time that the gauge points become worn from constant use. Obviously the abandonment of the gauge due to this wear would result in considerable loss of tool steel. Instead of throwing the gauges away, the ends of the adjusting screws of gauge Figure 1 are ground and lapped after which they are adjusted to the proper limit. In the case of the gauge shown in Figure 2, it becomes necessary to draw the temper of the gauge, upset the metal and machine to the proper dimension, finishing by lapping the points.

The Making of Gauges

Snap-gauge blanks such as are shown in Figure 2 are obtained through machine-tool houses and can be purchased in various sizes as required. The blanks are drop forged from tool steel and are soft when received. The only machining required is on the gauging points which are left sufficiently long to permit their being reduced to the required dimension. The gauge is machined while soft to within about .007 in. of the desired dimension and then the gauge points are hardened. The gauge is then ground on a smooth wheel removing about .004 in. from each surface. The remaining .003 is removed by lapping.

The lapping allowance must be sufficient to remove the tool marks from the gauge surface. This is important and where the wheel used for grinding is very coarse the lapping allowance must be greater than .003 in. This amount can be removed very readily by the use of FFF emery mixed with sperm oil and a little kerosene.

"NOW ASK ME ONE"

John F. Faber, Academy High School, Erie, Pa.

This is the third installment of questions on vocational education and industrial arts.

Questions

1. What was the Smith-Sears Act and whom did it affect?
2. What entrance age to unit trade courses is set by the Smith-Hughes Act?
3. Name two objectives of industrial-arts courses.
4. What is the chief aim of trade-school instruction?
5. Name three advantages of the junior-high-school organization.
6. Name two men who are prominently mentioned in the history of industrial education prior to its introduction in the U. S.
7. What exhibition of handwork influenced most the industrial-education movement in America?
8. In what country was the Sloyd system first introduced?
9. What school was a pioneer in the U. S. in providing trade education for poor boys, unable to afford a college education?
10. Where was the first compulsory continuation school introduced in the United States?
11. What industrial-arts subject offers the best all around industrial experiences?
12. Name at least three national leaders in vocational education in this country today.
13. Why is vocational education more necessary now than a few years ago?
14. What are two main types of trade education found in the public schools?
15. Give four ways a vocational instructor may keep abreast of advancement in his trade and in education.

(See page 350.)

MANUAL ARTS

Makes for self-confidence.
Accentuates conception of accuracy.
Neutralizes surplus energy.
Utilizes powers of ingenuity.
Arouses additional interest in school.
Lightens discipline.

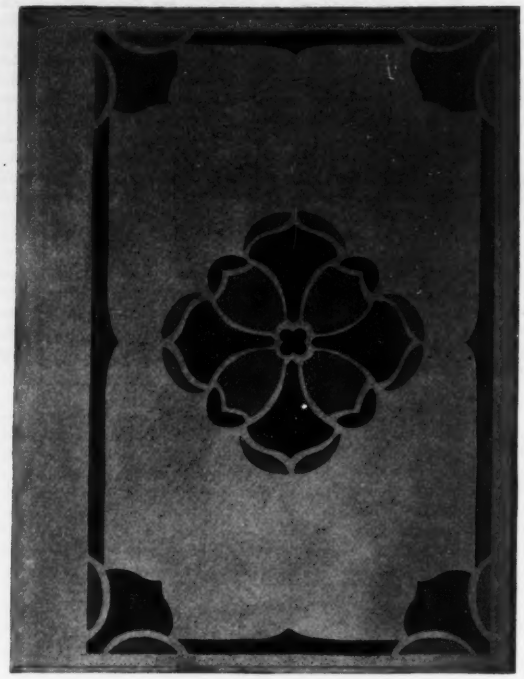
Assists in finding aptitude.
Reveals additional fields of knowledge.
Trains in systematic working habits.
Stimulates thinking and doing.

C. M. Gilmore.

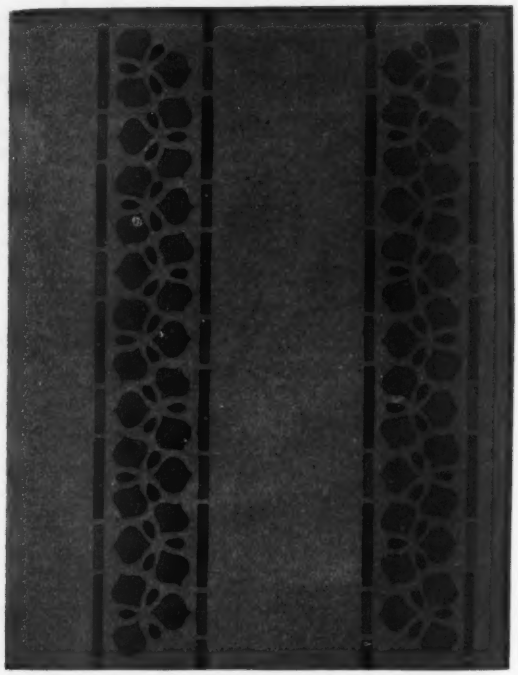
DECORATIVE STENCILED BOOK COVERS

D. Elizabeth Roberts, Philadelphia, Pa.

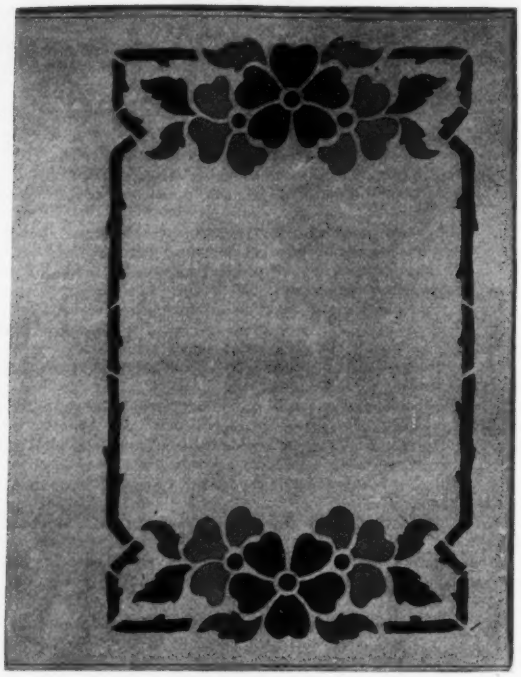
The book covers illustrated were stenciled with oil paints on gray and tan linen and linen crash. It takes very little time to make one of these decorative and useful covers and very few materials are required. Almost everyone knows something about the popular stencil work, but for those to whom it is new, a few directions will be necessary.



DESIGN NO. 1.



DESIGN NO. 2.



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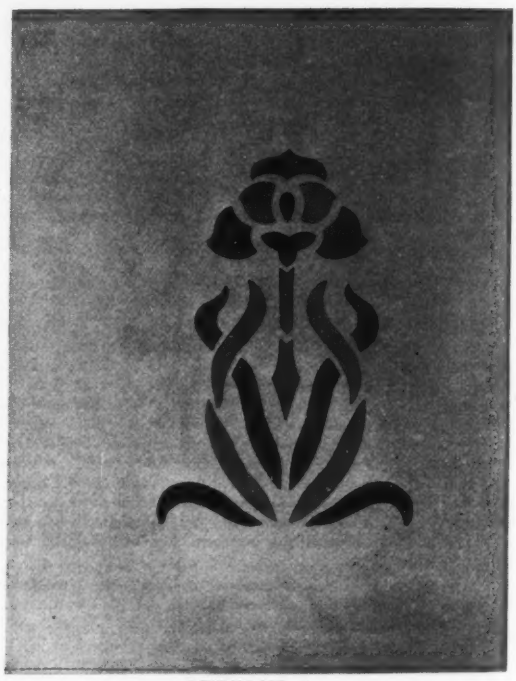


DESIGN NO. 4.

First the design is transferred to stencil paper, and then cut out with a knife. The material is stretched over a blotter by means of thumb tacks. The stencil is then placed on the material, the size of the book cover and also the space for the stenciling having been previously planned and marked on the material. If oil paints are used, mix them with turpentine until they are about the consistency of cream. It is well to add a few drops of stencil medium, as this helps to set the color. Use flat bristle brushes, and be careful not to use too much color on the brush. Also have a different brush for each color. After the stenciling is finished, allow the colors to dry for at least a day, and then press with a hot iron, laying a wet cloth over the wrong side of the material. The book covers shown in the illustrations were made for an ordinary-size book, but of course the cover may be made to fit any book. Those illustrated measure 8¼ inches by 12½ inches when finished, and the pockets for the backs of the book are 3¼ inches wide. The front of the cover where the stencil is placed is 5½ inches wide, while 1½ inches are allowed between the back and front for the thickness of the book. A cover that size, as

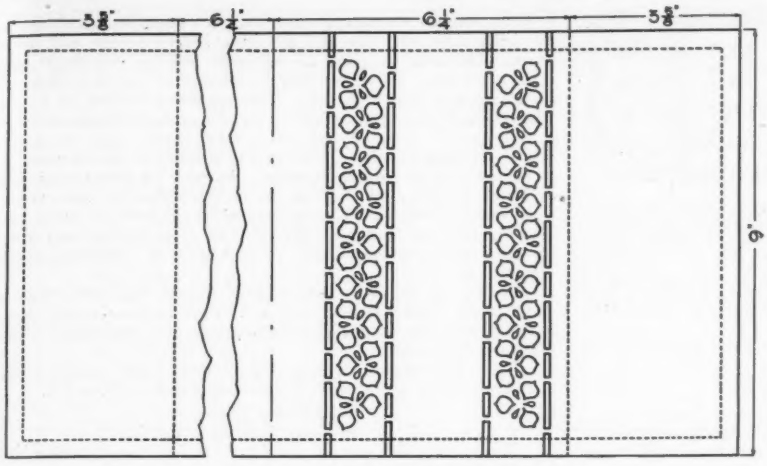


FIG. 1. LAYOUT OF BOOK COVER.

shown by Figure 1, requires material 9 inches by 19¾ inches, these measurements allowing ⅜ of an inch along each edge for a hem. First make a hem on each side, along the edges which are 9 inches, and then stitch both hems. Then turn in the hem at the top and bottom along the entire length of the cover, but before stitching, turn in the pockets 3¼ inches on each side.

Design No. 1 was stenciled in two shades of bluish green on light gray linen crash. Two shades of dull blue would also be attractive.

Design No. 2 was done on tan linen with the design done in yellow, brown, and green.

Design No. 3 was stenciled on gray linen crash, using two shades of rose for the flowers and green for the leaves and stems.

Design No. 4 was done on écrue linen crash, with the flower form in a dull shade of orange and the leaves in two shades of green.

The colors used for these covers were Prussian blue, chrome yellow, crimson lake and cremnitz white. The pink tones were made by mixing crimson lake and a touch of yellow and blue, with the addition of white. The orange tone was made with crimson lake and yellow, with a little touch of blue. The dark greens were obtained by mixing blue and yellow with a slight touch of red, while the addition of some white to the dark color produced a very good light green. The brown was made by mixing red, blue, and yellow, using more yellow than the other colors.

SOME TEACHING HELPS FOR MANUAL-TRAINING TEACHERS

Dr. J. I. Sowers, director of the department of vocational education at Miami, Florida, has developed a complete plan for aiding teachers in the service to grow professionally, and to overcome their difficulties in the way of professional preparation. Dr. Sowers believes that it is an essential part of the superintendent's theory of the school system to keep teachers regularly in touch with educational growth and with fundamental educational theories. Through his instrumentality, a club including all shop instructors, has been formed and monthly meetings provide an opportunity for discussing problems and interests.

One of the several means adopted by Dr. Sowers for promoting growth is a monthly bulletin which takes up some aspect of shop organization, class management, or teaching method. The following material is taken from a bulletin issued several months ago, and is typical of the discussions:

"In order to justify a place in the curriculum and to secure adequate benefits to the student, and to absolve school officials for the expense of maintenance, it is absolutely necessary and essential that manual-training work be wisely and broadly conceived, judiciously organized, richly supplemented, carefully prepared, and skillfully presented.

The Lesson

"The lesson is not an isolated task; it should have a definite relation to that which has gone before, and that which is to come after. It is a cooperative undertaking of teacher and pupil. It is an essential unit, of an organized body of material, which is to be dealt with at one time. It comes from and uses material in past lessons, and leads to other lessons which are to follow, offering its own contribution to the general plan of a course.

"*Steps in a lesson:*

Preparation — Application
Presentation — Test

"*Methods of teaching the lesson:*

The lecture method
Illustration
Demonstration
Test

"*Line of approach in teaching a lesson:*

The informational line of approach
The developmental line of approach

"Note: '*Lines of approach*' refer to the policy of the instructor in handling a lesson or any steps in a lesson. '*Teaching Methods*' refer to the particular devices which may be used under either line of approach.

The Demonstration

"In the beginning of any art it is always a wise policy to put the beginner into possession of such established uses, mechanical operations, and devices as long experience and study have found valuable. It is this that the *demonstration* attempts to do. This method of instruction gives the student or the novice in a trade, information quickly and exactly that he would otherwise only be able to arrive at after long effort and costly errors.

"There are certain principles by which the demonstration must be guided and certain requirements which it must satisfy in order to fulfill the purposes and meet the needs for which it is given. Some of these guiding principles are:

"1. The demonstration must be so timed as to meet the immediate needs of the class with the work now in hand.
"2. It must present a single fundamental use, procedure, or fact.
"3. The demonstration must be brief.
"4. The work of the demonstration must be skillfully done.
"5. The whole performance must be accompanied by concise and discriminating questioning and by a clear, accurate statement or discussion of the vital points involved in the demonstration.

Steps in the Demonstration

"1. A statement of the definite problems involved in the demonstration.
"2. The actual execution of the work proposed in the demonstration.
"3. The *summary* of the work done and the points to be emphasized, and the *test* of the student's understanding.
"4. Assignment (this consists of definite instructions to the students for doing the work).

Immediate Shop Objectives

"Speaking of immediate objectives in shopwork, Dr. Sowers distinguishes manipulative from the nonmanipulative objectives. He writes:

"When we come to examine our manipulative objectives we shall find that they are about three in number as:

"1. To provide opportunity for boys to make and do things.
"2. To provide training in common skills everyone should possess.
"3. To provide trade exploratory or tryout experiences in typical trades to assist boys in testing their aptitudes and interests.

Nonmanipulative Objectives

"1. To provide training in industrial art and in industrial art appreciation (partly manipulative).
"2. To provide a natural medium for guidance, educational and vocational.
"3. To provide interesting technical information about the occupations represented in the school, and in the community.
"4. To provide studies in vocational economics closely related to everyday life.
"5. To provide organized training in reasoning and problem solving.
"6. To give at least an initial understanding of the place of drafting and mathematics in relation to the trades."

SOME PRODUCTS OF THE SHEET METAL SHOP AT MOOSEHEART, IND.

PROBLEMS & PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration.

DEPTH GAUGE

Arthur F. Ahr, Woodlawn, Pa.

(See Supplement Tracing No. 69.)

The depth gauge is a useful tool and an appropriate machine-shop problem, either for the regular course of study or as a supplement.

It is made of machine steel and drill rod. The base, screw and nut are of machine steel, and the rod of drill rod.

The base is case hardened and the gauging surface accurately ground. The sides and top are blued or mottled. The screw and nut are also blued and may be heat treated if desired. The rod is hardened at the base end and accurately ground. Different length rods may be made if needed. The six-inch is chosen as the best adapted to the average use.

DAVENPORT TABLE

C. A. Rosell, Arsenal Technical Schools, Indianapolis, Indiana

The davenport table is a piece of furniture that is found more commonly in our homes today than ever before. This is probably due to the fact that it is a very serviceable piece of furniture which accommodates a great many things that one wants conveniently about in a living room. Besides, this adds to the attractiveness of the room. Davenport tables vary greatly in structure, some being very massive and others very light and slender in construction. The accompanying drawing shows one of the latter type emphasizing slender lines.

It has the advantage of being so constructed that it can be knocked down just like the commercial tables. Because of the stretcher between the legs at either end, it cannot be constructed as an ordinary kitchen table and still have hidden mortise and tenon joints. The ends are glued up separately and the two longer rails made removable. These rails may be mortised in loosely in order to get a good even joint at the legs. They are drawn up with lag screws. The stretcher running from end to end has a three-shouldered tenon at each end. It is held in place with screws coming from the underside of the short stretchers. Care should be taken to get this stretcher to fit as closely as possible by pulling the table up with clamps, and by boring holes a little closer to the shoulders than the holes in the short stretchers will be. The top may best be fastened on by the use of metal table-top fasteners. Be sure that provision has been made for these before gluing up the ends in order to facilitate ease in construction.

A table of this design was made of walnut, filled and stained a dark walnut, shellacked, and varnished. Each coat was sanded down and the last coats were rubbed with pumice and rottenstone. The result was very pleasing.

The table combines turning with cabinetmaking, correlating the two shop subjects and producing a serviceable and useful article.

WRITING DESK

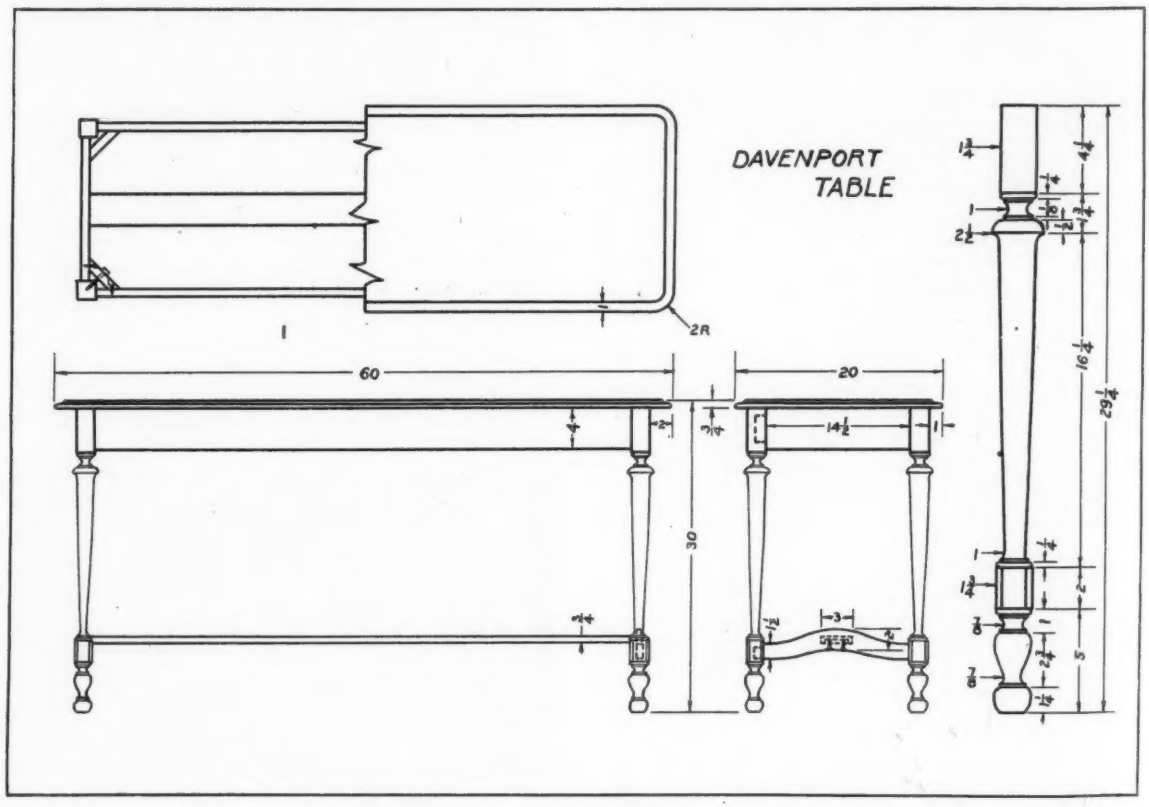
J. T. Williams, Compton, Calif.

The writing desk herewith described has been found to be a very fine project for the seventh grade. It is usually made of pine.

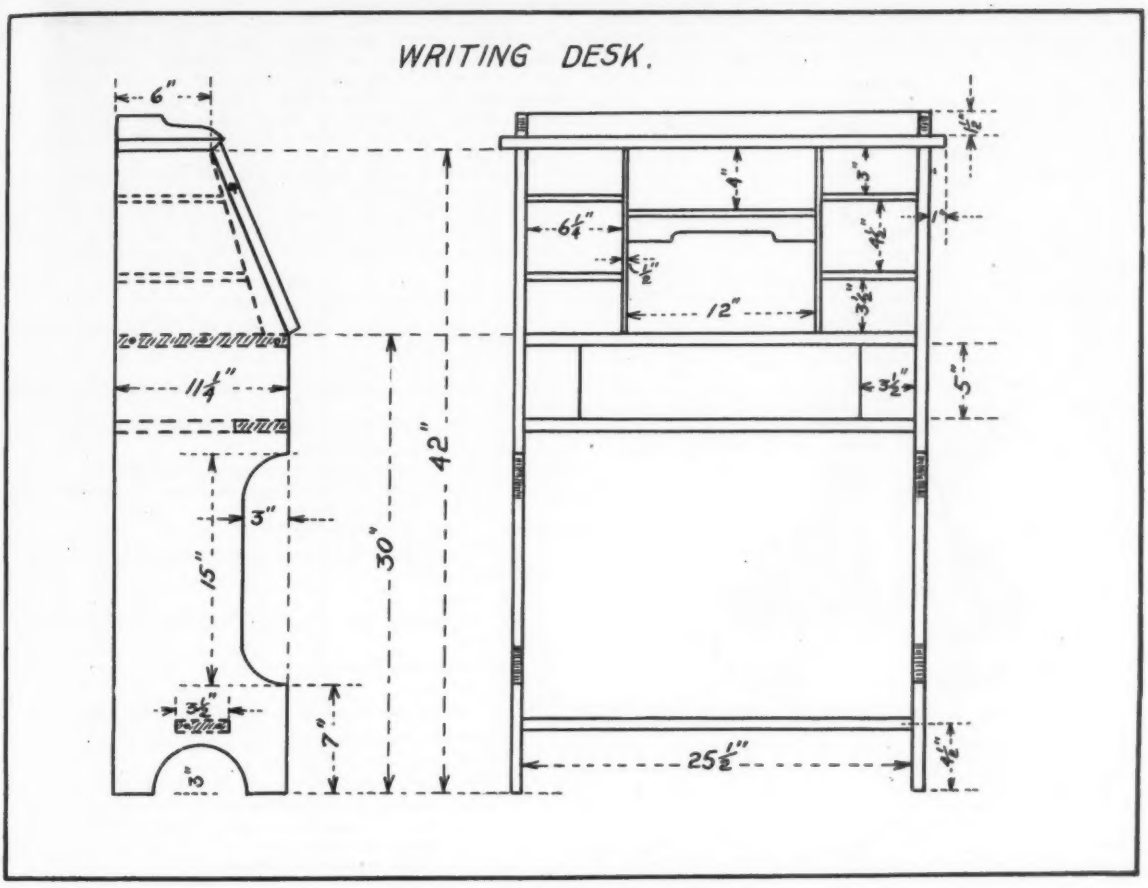
Bill of Material

2 pc.	1x12x42	S4S	Sides.
1 pc.	1x12x25½	S4S	Main Shelf.
1 pc.	1x 4x25½	S4S	Stretcher.
1 pc.	1x 4x25½	S4S	Drawer Support (Front).
2 pc.	1x 4x 5	S4S	Pieces at Sides of Drawer Front.
1 pc.	1x 8x27½	S4S	Top.
1 pc.	⅛x18x25½	3-ply	Back.
	Pigeon Holes		
2 pc.	½x12x12	S4S	Uprights.
4 pc.	½x12x 6¼	S4S	Short Shelves.
1 pc.	½x10x12	S4S	Long Shelf.
1 pc.	½x 2x12	S4S	Shelf Support.
	Drawer		
1 pc.	1x 6x18½	S4S	Front.
2 pc.	½x 5x10½	S4S	Sides.
1 pc.	½x 5x17½	S4S	Back.
1 pc.	¼x12x18	3-ply	Bottom.
1 pc.	1x16x27	S4S	Lid.
1 pc.	1x 2x25½	S4S	Long Top Strips.
2 pc.	1x 2x 7	S4S	Short Top Strips.

At ten cents per board foot the lumber will cost about three dollars. Two desk hinges for the lid, two knobs for the drawer, and



DETAILS OF DAVENPORT TABLE, DESIGNED BY C. A. ROSELL.



WRITING DESK, DESIGNED BY J. T. WILLIAMS.

a chain to support the lid, will increase the cost to about three dollars and fifty cents.

Suggestions

Cut the two pieces of 1 in. x 12 in. x 42 in. and be sure the ends are perfectly square and the pieces of equal length.

Lay out the sides according to the illustration. As there is danger of the wood warping, do not cut out the sides until the cross pieces are cut, so that they can be fastened together temporarily if they have to be left until the next lesson.

Cut out the sides.

Cut the main shelf, stretcher, and drawer support, and get the assembly started. The main shelf is first, using three 2½-in. No. 10 round-head blued screws in each end. The stretcher and drawer support can be fastened with two 8d finishing nails in each end. Then the top, fastened with three 8d finishing nails into the tops of the side pieces.

The back can be fitted between the side pieces, extending from the top to about one inch below the drawer. This gives sufficient rigidity to the desk.

For the pigeon holes, make the two sides first, then put in the middle piece, after which slide the completed set into place.

Put in the top strips next. They should be doweled and glued on.

The drawer is made so that it slides on a strip running from front to back, in the middle. A small notch in the back of the drawer fits over the strip.

The lid can be made of one piece of wood of the necessary width. It, however, can be built up by matching and gluing pieces together. Cut the lid to come flush with the outside edges of the desk.

The completed desk can be finished nicely with one coat of medium golden-oak stain and two coats of orange shellac. Or walnut stain and shellac may be used.

If gumwood is used, white shellac on the natural wood makes a beautiful finish.

TABLE-TOP CONSTRUCTION

Leon A. Orr, Principal, Junior High School, Bennington, Vt.

We had occasion to make twelve laboratory tables with one and one-half-inch maple tops of such a construction that they would not be affected by dampness of summer nor the dryness of winter. The accompanying drawing shows the method that was used in constructing them.

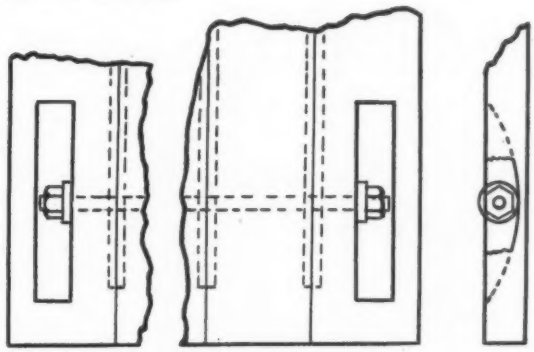


TABLE TOP CONSTRUCTION.

The drawing is a view of the underside of the top. The boards are three or four inches wide, put together with a spline and without gluing. The spline is put in near the top and the holes for the bolts are bored sufficiently below the center so that the splines and bolts do not interfere with each other. The grooves for the nuts and washers are made by repeated cuts with a circular saw. The number of bolts is determined by the length of the table top.

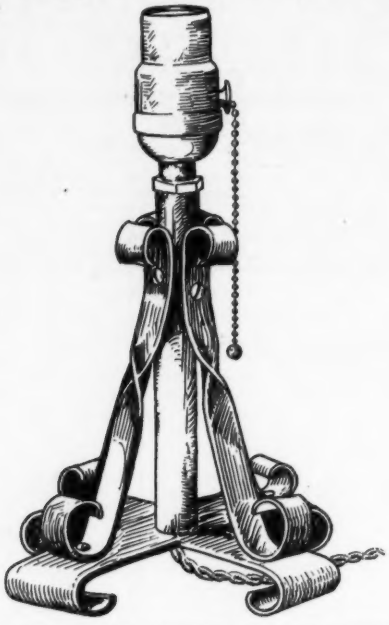
WRITING-DESK LAMP

J. W. Bollinger, Tulsa, Oklahoma

Making an electric-lamp base has always been an attractive problem for most boys. Here is one which is simple to make, and which is different from the usual type. It fits in as part of a bench metal-work course in the junior high school.

The base consists of two strips of No. 16 black or galvanized iron, 1½ in. wide and 8½ in. long, riveted together at right angles. Each of the four ends is bent over a ½-in. round rod. To make the problem more difficult, the base can be made out of one piece. If this is done, it will be possible, in addition to curving the ends, to shape the base in harmony with the curves of the rest of the article. The students thus obtain an opportunity for individual design.

For the uprights, 4 pieces of ⅛ in. x 9 in. strap iron are required. One end of each piece is bent over a section of ½-in. pipe; the other end is bent in the opposite direction, over a section of ⅜-in. pipe.



WRITING DESK LAMP, DESIGNED BY J. W. BOLLINGER.

To make the 180-deg. twist, mark off lines 2 in. apart, to locate where the twist shall begin and end. Place the piece in a vise at one of the lines, grasp it with a monkey wrench at the other line, and proceed to make the twist. It may be necessary to do some straightening afterwards. Drill the holes to receive the stove bolts, as indicated on the drawing. It is necessary that these holes be carefully located, or the lamp will not stand straight.

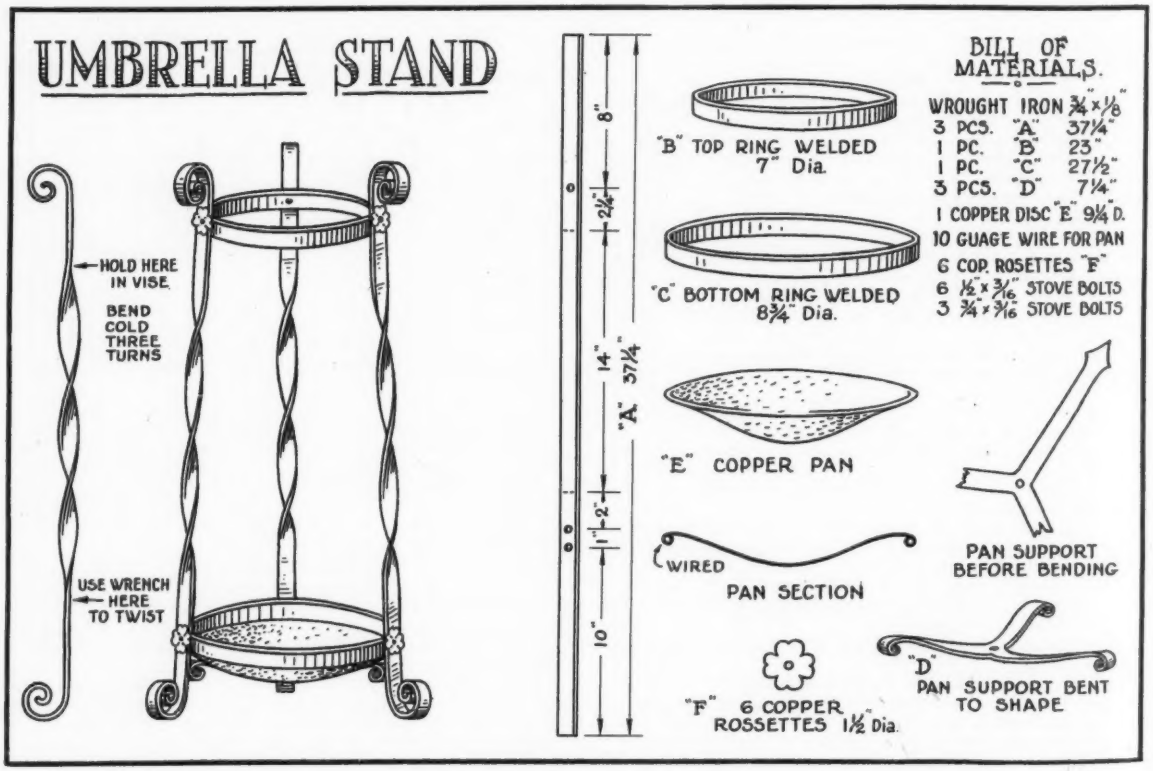
A ½-in. pipe nipple, 4 in. long, runs up through the center. To the top of this is connected a ½-in. to ⅛-in. reducer. A ⅛-in. close nipple completes the equipment. Another combination is to secure a ½-in. to ⅜-in. reducer, add a ⅜-in. to ⅛-in. bushing, and finish with the ⅛-in. close nipple. These parts can usually be obtained at hardware stores. A lamp socket, of the drop cord type, will screw on to the ⅛-in. nipple. The wire can then be passed down through the ½-in. pipe.

The finished article should receive two coats of enamel. The color scheme should either match that selected for the writing table set, or the lamp may be painted a flat black, and touched up with gold bronzing powder on the twists and at the bolt heads. A lamp shade of the proper design and color should be purchased.

Answers

(See page 345.)

1. The Smith-Sears Act provided for industrial rehabilitation for disabled service men.
2. 14 years of age.
3. Exploration for guidance and an acquaintance with industrial processes.
4. Preparation for successful entrance into industry.
5. *a*) Holds students in school longer.
   b) Provides for better exploration and guidance.
   c) Provides for adolescent education by grouping these pupils in one school.
6. Comenius and Pestalozzi.
7. Exhibition of University of Moscow at World's Fair in Philadelphia, 1876.
8. Sweden.
9. Williamson Free School of Mechanical Trades, Delaware County, Pa.
10. Cincinnati, Ohio.
11. Drafting.
12. Dr. Charles Prosser, R. A. Cooley, J. C. Wright.
13. Because of the failure of the apprenticeship system.
14. *a*) Full time or Unit trade.
    b) Cooperative Industrial or Part Time.
15. *a*) Reading current publications in education and industry.
    b) Study in extension or summer-session classes.
    c) Industrial employment.
    d) Visits to successful schools.



DETAILS OF UMBRELLA STAND, DESIGNED BY C. O. GREENLEAF, SARNIA, ONT., CANADA.

A TOOL CHEST

M. E. Dodge, Charlotte, N. C.

Nearly every real boy is a lover of tools. By adding a piece now and then it does not take long to collect a set of good tools, but it is necessary to have a place to keep them. Of course a tool chest is the proper place for tools.

The chest described in the drawings is of the simplest construction and yet it is built with strength. It is not a large one, but it is large enough to hold a cross-cut saw, ripsaw, plane, square, rule, marking gauge, chisels, and a few smaller tools. It will be noticed that the length of the chest is twice the width, and that the height is three fourths of the width. Therefore, the dimensions for anv size chest may be worked out easily.

Figures 1, 2, 3 explain the steps in construction. Figure 4 shows the finished product. The chest is nailed together as though it were to have no opening. It is then sawed open, one third of the way down from the top. Care should be taken not to drive any nails where it is to be sawed apart.

After the chest has been properly sanded, it may be either painted or stained and varnished.

TONG RACK

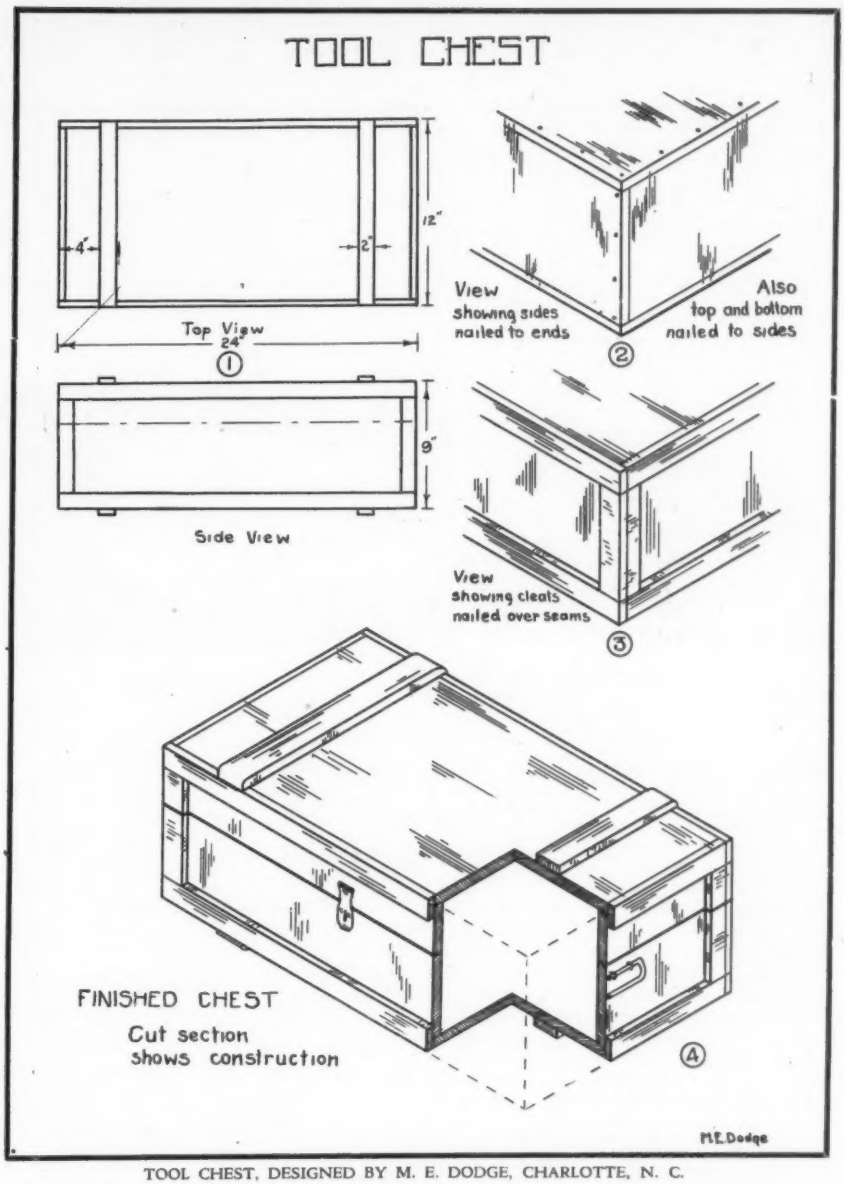
R. B. Newhauser, Milwaukee.

The tong rack in the accompanying drawing was designed for use in the metal-working department of the Shorewood schools and has been found convenient for taking care of the various tongs used in forge work so that they are not in the way of the student when he is working at the forge.

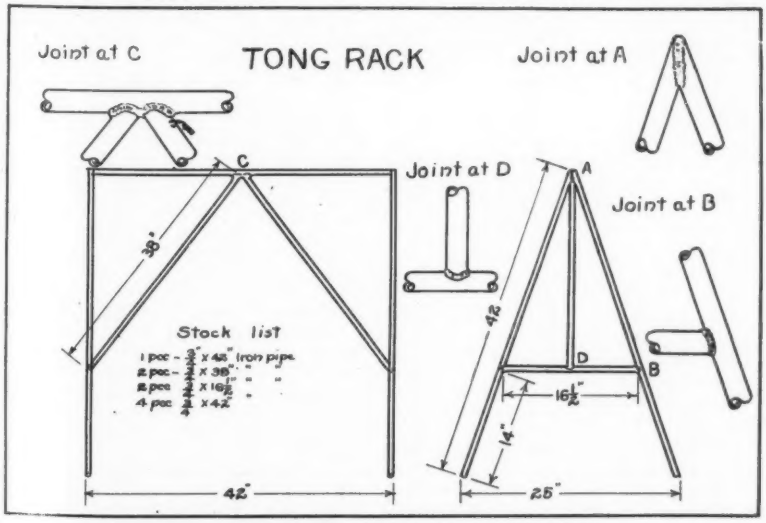
The rack may be constructed either of 1 x 1-in. angle iron or ¾-in. black-iron pipe, although the pipe makes a neater job when completed. There are three methods by means of which this rack may be assembled, viz.: by riveting, by the use of pipe fittings, and by means of welding. The latter method makes the most rigid job and was used by the author.

If it is constructed of angle iron it may be either riveted or welded. However, if it is constructed by using pipe fittings, the design will have to be modified somewhat, particularly the triangular standards. The pipe should be cut to dimensions and V'd at the joints so that a sound welding job may be done, as shown in the drawing. No flux is needed, although a good grade of welding rod should be used with a neutral flame. The joints should be first "tacked" together before welding all around, otherwise there will be difficulty in keeping the various units from warping as the assembly proceeds.

If desired, the builder may attach a set of swivel casters in order to make the rack portable. A coat of either black or gray engine enamel will give a finished appearance to the rack.



TOOL CHEST, DESIGNED BY M. E. DODGE, CHARLOTTE, N. C.

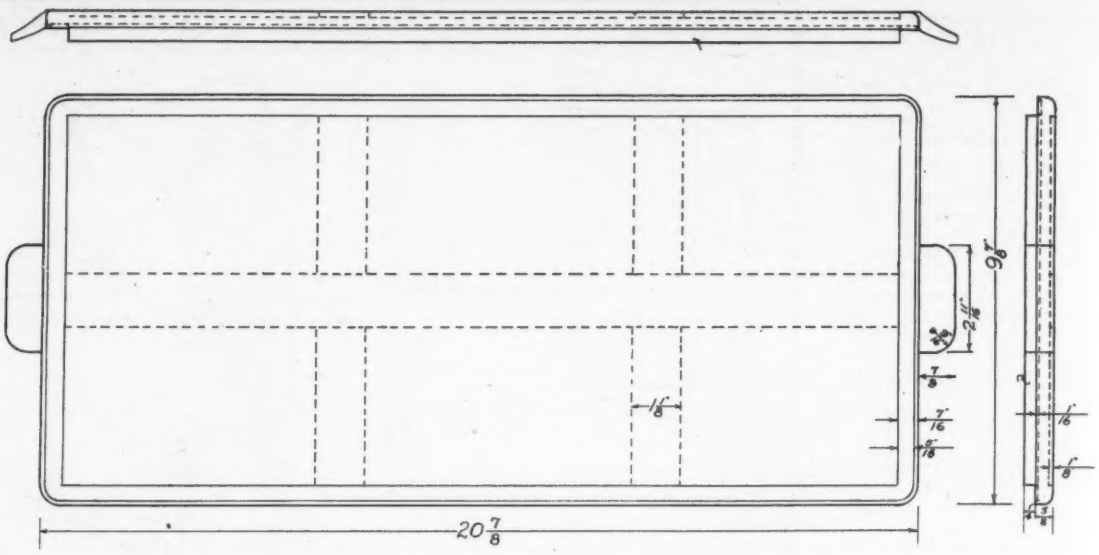


DETAILS AND STOCK LIST FOR TONG RACK.

ALUMINUM GRIDDLES

A. J. Goldborg, Foundry Instructor, Hibbing Junior College, Hibbing, Minn.

Aluminum griddles make very good problems for both the foundry and machine shop. The rectangular griddle illustrated was designed to cover two burners of the ordinary gas range and the round one a single burner. As cake batter will not stick to aluminum, no grease or fat is required in the baking of the



DETAILS OF OBLONG GRIDDLE.

cakes, thus making aluminum a very desirable metal for this problem.

In making the mold for the rectangular griddle, it is best to mold the top of the machined surface in the drag so that the finished surface will be free from dirt and the inevitable oxide which would leave the machined surface full of pits and holes. A quarter of an inch finish should be allowed on the pattern in order to give plenty of stock for finishing.

By gating the mold through the handles, the rounded edge is left intact.

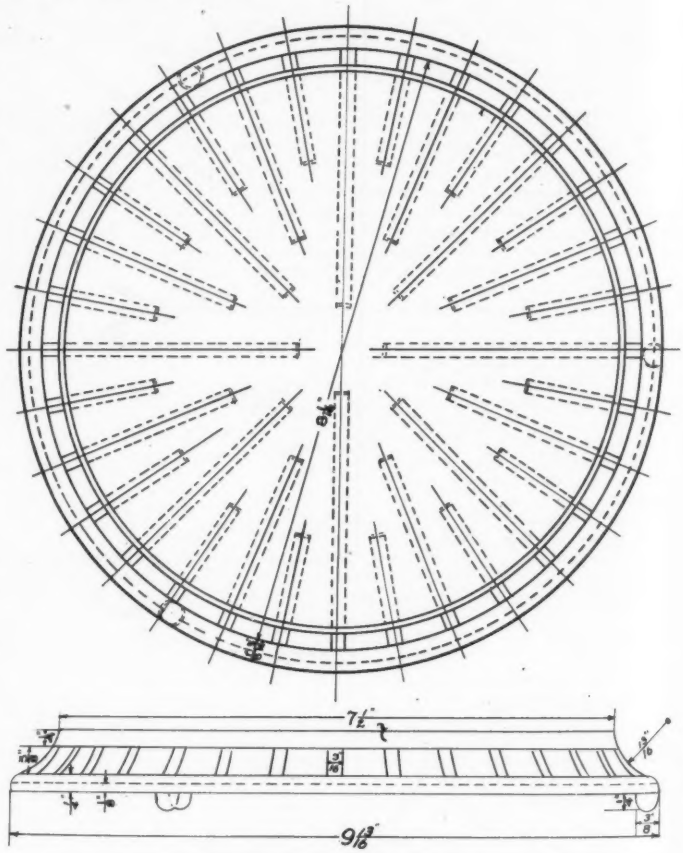
Because of the fact that the perforations in the circular griddle are cored out with a green sand core, care must be used in making the parting. The face of the green sand core must be slicked back of the inside edge of the bottom ring; otherwise it will be difficult to get a clean impression when drawing the pattern from the drag.

If gated to the bottom ring of the pattern, a wide gate with plenty of runners must be used to prevent the metal from chilling before the mold is filled. It can be poured from the top by putting the sprue in the center, but the drag must be slicked down beneath it to prevent washing.

Our aluminum castings are made from crankcase scrap. This can be bought here for twelve to eighteen cents per pound. It is generally what is known as the No. 12 mixture which is very tough and fairly hard. Our standard patterns are cast with this mixture in order to save the inevitable pattern breakage. Some of the boys made the patterns the first semester, cast them the second, and the next year had the opportunity of finishing some of the castings.

It is easy to work in the practical use of chemistry in foundry work. The making of zinc chloride for the reduction of the aluminum oxides forming zinc aluminate is simple yet necessary chemistry. The simple carbon analysis, the use of etching acids for pickling castings, solutions of sulphuric, nitric, and hydrochloric acids, showing their reactions with the silicate scale, are all desirable experiments.

Aluminum and brass castings can be made in any school having a forge. The purchase of a graphite crucible, some molding sand and a few tools, such as trowels and slicks, comprise the necessary equipment. The foundry sand can be bought in small quantities from the nearest foundry. With a good bed of coke under and around the crucible as high as the top, the aluminum and brass will melt readily. A little simple molding will act as a tie-up between patternmaking and machine-shop practice.



DETAILS OF CIRCULAR GRIDDLE.

ILLUSTRATING A PRINCIPLE OF AERODYNAMICS

Joseph J. Lukowitz, Milwaukee, Wis.

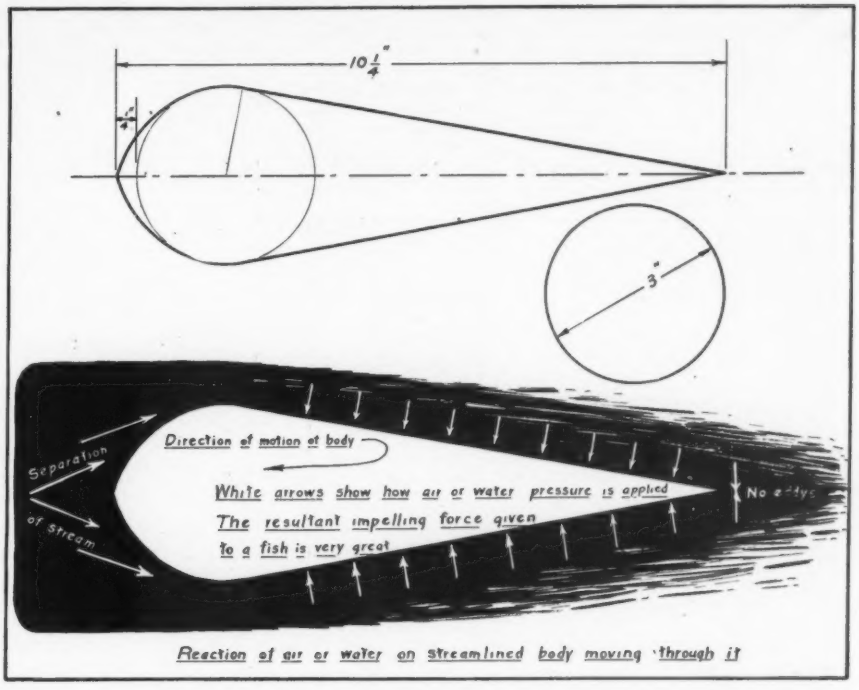
The present great interest in aviation gave impetus to the description and illustration of this interesting and scientific principle of aerodynamics. Some time ago, the author devoted ten or fifteen minutes of class time, over a series of class periods, to the discussion of some of these thought-provoking problems which are proving exceedingly interesting to boys.

The time was well spent, for each week one question, pertinent to aviation, was asked which was reasoned out or looked up before the next class period. It was surprising to see the interest in these

facts about airplanes. Each boy respected the opinion of the other and undoubtedly some analytical and constructive thinking resulted.

The author believes it the duty and privilege of the teacher to present practical, thought-provoking problems to his pupils. The limited skills which may be acquired in the elementary industrial arts may be carried over into other fields to a rather limited extent, but in developing these skills, if we unduly emphasize production and fail to use the proper teaching technic, we have neglected to train the reasoning power of the individual to a great extent, for there is inherent in industrial-arts work the potent germ of purposeful activity with its manifold educational advantages and leads; it is obvious to any educator that the mere telling "do this" and then "do that," with scarcely a thought-provoking question, is not making use of the educational opportunities presented constantly in this type of schoolwork.

It is not inferred here that there are not enough opportunities in the regular work for developing the reasoning faculties; on the contrary, to say the least, thought is challenged by the very constructive activity of the boys. We all know that a diversion like the above is inspiring, for the airplane is a fine example of scientific knowledge and accuracy and of the cooperation of the various crafts concerned.


10 1/4"
3"
Direction of motion of body
Separation of stream
White arrows show how air or water pressure is applied
The resultant impelling force given to a fish is very great
No eddys
Reaction of air or water on streamlined body moving through it

DETAILS OF A SPINDLE FOR ILLUSTRATING PRINCIPLE STEAM LINE CONSTRUCTION.

The accompanying drawing illustrates a simple tapering spindle of definite dimensions. As a wood-turning exercise, it is not as easy to execute as one might imagine for it calls for the exercise of good judgment and skillful tool control. The turning of this taper when motivated by the following experiment will prove of great value in clearing up an otherwise abstract principle of the reaction of air or water on a streamline body moving through it.

Birds and fish have perfect streamline forms, each in a way best suited to its requirements, and it was not until man copied the design of the bird's wings by making the wings of his airplane similar in cross section to those of a bird and learning the great value of streamlining all exposed parts of the airplane, that he was able to fly successfully. Why is the body of a bird thick at the front and tapering toward the tail? Why is a fish so formed? Does it not seem that a bird or a fish might be able to navigate more easily if they were so formed as to split the air or water by a long, conical point, thus making it easy for the bulk to move through it? Isn't it a marvel how the goldfish can swim without any apparent movement; still more marvellous is the soaring seagull, or swallow, who soars on and on with no apparent movement of the wing.

As a fish swims, or a bird flies, the elements of the parted body of air or water spring together again after they pass the point of maximum separation, and thus nullify the head resistance almost completely by a definite propelling pressure exerted against the tapering sides of the body as it escapes from between the wedged-apart masses of the surrounding atmosphere or water.

In proving the phenomena with the theory presented, first be sure that your taper is perfectly smooth, then shellac and sand it while in the lathe. Remove it from the lathe and apply a thin coating of vaseline or grease to the entire taper surface. Now grasp it in your hand and hold tightly. It slipped; try it again. Slipped again; why? Because the pressure of the fingers is exerted perpendicularly to the sides of the taper, thus pushing the object forward. The pressure of the water against the fish has the same effect as the fingers against the greased taper. Suppose your fingers touched every part of the taper at the same time; imagine how it would slip from your grasp. Remember that the water touches every part of the fish and that the air touches every part of the bird, thus making the reaction impulse very efficient. Study the sketch and note the direction of the application of force (apply this principle to exposed parts of boats, racing cars, and airplanes).

After the experiment has been tried in the science laboratory, the spindle may be taken home and the experiment demonstrated and discussed for the benefit of members of the family. This is one thing, which education—whether it be science or industrial arts, or a happy combination of both—should do. It should point out to the student the possibilities in nature; he should learn to read the "sermons in stones," both for their cultural and their practical, thought-provoking value.

THE SPEEDSTER AS A SCHOOL-SHOP PROJECT

S. N. Horton, Instructor in Auto Mechanics, Flint, Mich.

The accompanying cut illustrates one of the major projects in auto mechanics worked out at the Emerson Junior High School, Flint, Mich. The speedster was begun in November and was completed late in April. It is painted in the school colors of black and orange.

The chassis and the engine were taken from a 1918 Ford for which the sum of $10 had been paid. Parts of eight different cars were used in the construction of the car. The engine contains lightweight, drilled-skirt two-ring pistons, drilled connecting rods, a counterbalanced crankshaft, tractor valves, and high-tension ignition. The cylinder head is machined down to increase the compression. The

THE COMPLETED SPEEDSTER.

engine is equipped with two Zenith carburetors and an exhaust from each cylinder leads directly into a 4-in. pipe running the full length of the car. The frame has been underslung leaving a road clearance of 4 inches.

Five shops correlated in working out the project as follows: The mechanical-drawing classes prepared the preliminary sketches and made the completed working drawings; the sheet-metal shop designed and made the body; the electrical shop worked out the ignition system and did the wiring; the woodshop constructed the frame; the auto-mechanics class regulated the engine, constructed the running gear, and assembled the whole job.

The car has attained a speed of 61.2 miles per hour on a test run. The job gave considerable experience in various types of work and aroused a good deal of interest.

A TOOL PROBLEM SOLVED

Carl J. Orness, Instructor Auto Shop, Lincoln High School, Lincoln, Nebraska

The task of starting all of the students in a shop class and quickly equipping them with tools is often a difficult problem for the instructor. To meet such a situation, I have divided my classes into five groups, each having a foreman. At the beginning of the period, each foreman checks out a tool truck which has enough wrenches and other tools to keep three or four boys supplied to do many of the average jobs in an auto shop.

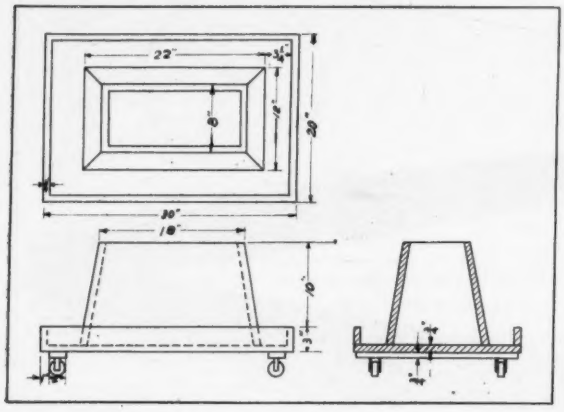


FIG. 1. TOOL TRUCK.

Figure 1 gives the design and dimensions of the truck. The tray around the bottom of the pyramid gives a place for additional tools which helps to eliminate loss from leaving them on the running boards or other places on a car. Inside the pyramid there is ample space for an extension lamp, waste or wiping rags, grease and oil can, etc. These trucks are made of one-inch soft pine and mounted on 1½-inch double rollers. The tools are hung with square hooks screwed into the wood. The trucks are painted blue-grey with outlines of the tools in black. This assists in detecting missing tools at a glance.

Each truck is equipped with the following tools:

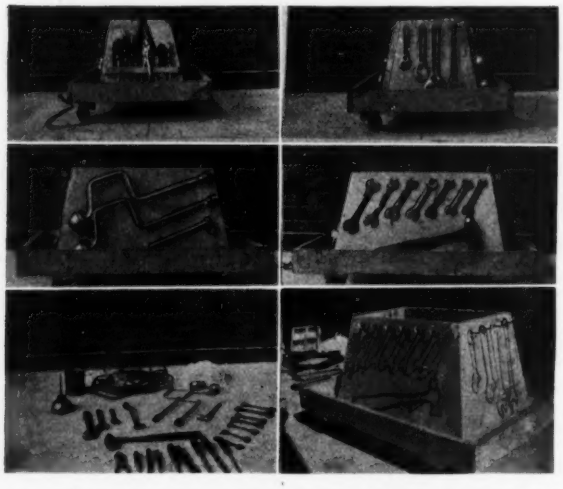
On one end:
- 1 small round file
- 1 triangular file
- 1 small mill file
- 1 ½" center punch
- 1 8" combination pliers
- 1 ½" solid punch
- 1 ½" cold chisel
- 1 putty knife
- 1 screw driver

On the other end:
- 1 6" Cresent wrench
- 1 8" Cresent wrench
- 1 10" Cresent wrench
- 1 Ford spark plug and cylinder-head bolt wrench

On one side:
- 1 Waldron No. 6024 speed wrench
- 1 Waldron No. 6018 speed wrench
- 1 Waldron No. 4218 L-handle wrench

On the other side:
- 1 ¾ lb. ball peen hammer
- 1 No. 725 Williams end wrench
- 1 No. 25 Williams end wrench
- 1 No. 725B Williams end wrench
- 1 No. 27 Williams end wrench
- 1 No. 727 Williams end wrench
- 1 No. 729 Williams end wrench
- 1 No. 29 Williams end wrench

Inside the pyramid:
- 1 30-ft. extension lamp
- 1 ½-pint oil can
- 1 can hard oil
- Waste or wiping rags



ARRANGEMENT OF TOOLS ON THE TOOL TRUCK, DESIGNED BY CARL J. ORNESS, INSTRUCTOR AUTO SHOP, LINCOLN HIGH SCHOOL, LINCOLN, NEBRASKA.

Each truck has a letter painted on one end and each tool on that truck has the same letter painted and stamped on it with steel letters. This prevents exchanging tools from one truck to another. At the end of the period the trucks are stacked on top of each other and rolled into the tool room, thus taking up only a very small floor space.

This system was adopted in the high school auto shop at Lincoln, Nebraska, in January, 1927. Four classes used these tool trucks each day and only two tools disappeared by June first. This loss is almost negligible where students are not requested to purchase tool kits for their use in the school shop.

A BELL-RINGING TRANSFORMER AS A TRANSFORMER PROJECT

Wynne L. McDougal, Head of the Department of Electricity of The Pullman Free School of Manual Training, Chicago, Illinois

Many of the transformers made in school shops are scarcely usable when completed. Not that they are poorly constructed, but the design of the transformer is usually such that it can hardly be adapted to any particular purpose. Any school-shop project should be selected with its commercial, or perhaps we had better say usable qualities in view. To teach the principle of the transformer then, the bell-ringing transformer, furnishes a very good project.

First, it can be constructed inexpensively. The one described in this article costs about forty-five cents. This alone is an item to be considered, for while its construction is representative of that of the more expensive transformers, yet its cost comes within the reach of the poorest purse.

Again, it does have a commercial value, for today we find it supplying the current for the doorbells of nearly all new buildings where doorbells are used. It has practically superseded the dry battery for that purpose.

The greatest trouble however, is to get a core. To overcome this, drawings for a punch were made in the drawing room. The punch was then made in the machine shop. It was a rather difficult job, however, and it came out warped. At last the matter was taken up with a manufacturer of transformers and he finally consented to sell the school, punchings of a convenient size by the pound.

The core of course, fixed the dimensions of the coil and the insulation thickness had to be watched with unusual care. Figure 1 shows two views of the completed transformer. It shows also views of most of the parts. Figure 2 shows the dimensions of the parts.

The completed winding is shown at 9 in Figure 1. It is wound on a pressboard spool with a center hole large enough to take from twenty-two to twenty-five laminations. As spools vary somewhat it is well to have them filled to the limit with core iron, for a loose core is a noisy one. The spools for this project are formed on a round bar, and after they have been glued and dried, a somewhat smaller mandrel is used to wind them on, for the wire tightens the spool on the original mandrel so that it cannot be removed. A wedge inserted in a groove in the winding mandrel keeps the spool from turning as the coil is wound. A simple punch can be constructed and used for punching out the spool ends, but that is only a matter of convenience and can be dispensed with, as they can be cut out with snips. Their appearance is of small moment as they are not visible after the transformer is completed. For winding the coils a very efficient coil winder was constructed. It is reversible, has a variable speed controlled with a foot pedal, and is equipped with a revolution counter. While not so convenient, an ordinary speed indicator can be held in a lathe against the work and secured from turning by a lathe dog. In this way the revolutions can be counted as well as with the more elaborate outfit.

Because of the very limited space enameled wire should be used. It is well to slip the thinner end washers on the spool as false ends, and bring the leads of the coils out between them and the true spool ends. Sufficient wire should be left projecting from the windings to make the required length of leads probably six inches or so. The secondary, or low-voltage coil, is wound on first. It is of No. 27 B. & S. gauge enamel wire. It will take about 330 turns as it is advisable to fill out the last layer although 300 turns fulfill the requirements of the calculations. Bring the final end of this coil out between the washers at the other end of the core. Put on a layer of insulating paper. Fiberoid of .015 inch thickness does very well. The primary or high-voltage side is wound directly over this. This primary winding is of No. 36 B. & S. gauge enamel wire and has approximately 2100 turns. It is also advisable with the primary coil to completely fill the last layer.

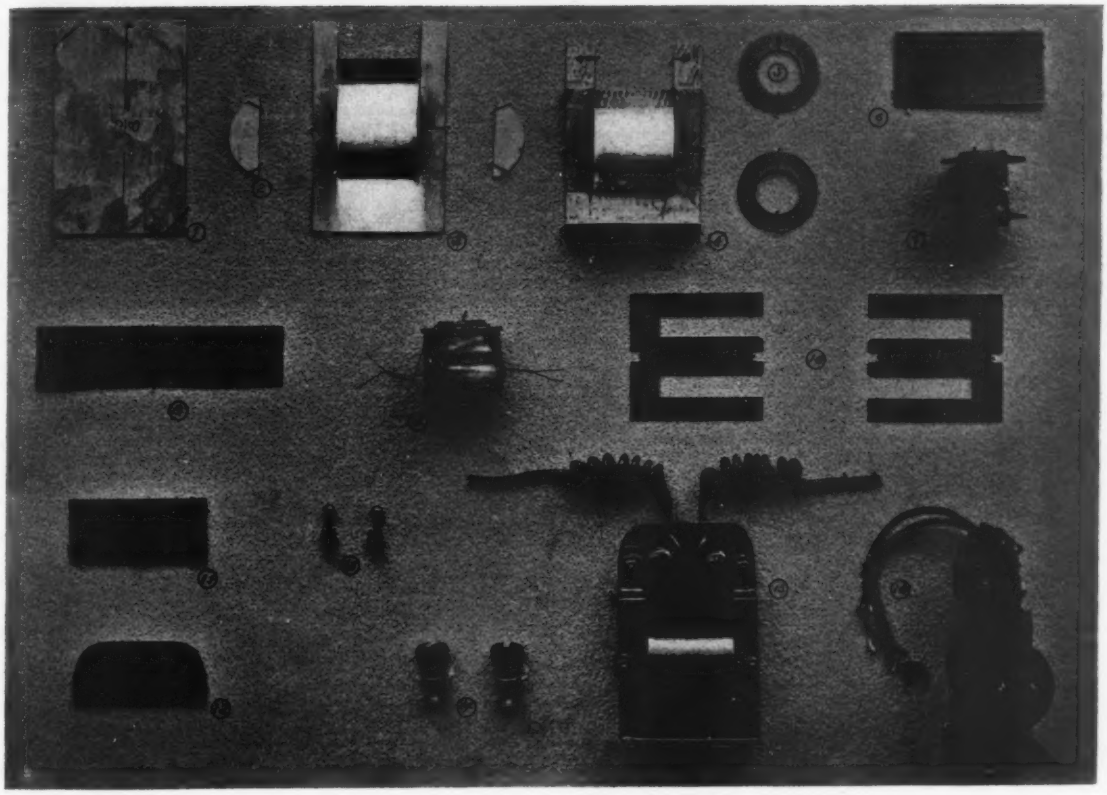


FIG. 1. PARTS REQUIRED TO MAKE A BELL-RINGING TRANSFORMER.

As the voltage in this coil is somewhat high for enamel insulation it is best to insulate between every four layers. The limits to the coil size require that this insulation between layers be very thin. A .0015-inch fish paper was used for this purpose. No. 36 wire is exceedingly small and has very little mechanical strength, so care will have to be taken in its winding. When broken it can be spliced, if soldered with a nonacid flux and care be taken to remove the almost invisible insulation. When this coil is completed, cover it with insulating paper. The leads from the primary should be brought out with No. 18 rubber-covered fixture wire, and care should be taken to see that they are firmly secured so as to convey no mechanical strain on the No. 36 wire of the winding.

Do not put 110 volts across the primary coil until the core has been inserted, as the reactance will be lacking and there is not sufficient resistance to withstand this pressure. The core is put in by inserting the laminations from alternate ends until a snug fit is obtained. Tests should now be made for grounds and opens. After the test, the transformer is electrically complete.

The case is formed of No. 26 galvanized iron. Cut it as shown at 1 in Figure 1. At 3 in Figure 1 is shown the next step. Here, the part of the case covering the spool is formed around a mandrel just the size of the spool. The end pieces are cut as shown at 2 and soldered in. Two of these parts as shown at 4, make a case. Provision should be made, at the top of the spool covering of one of these, for the carrying out of the leads. These go to the fiber piece shown at 12. The parts are held together with bolts. It would be well to apply a good coat of paint to the whole of the metal parts, because the transformer may be mounted in a damp place.

The primary is connected directly across the 110-volt alternating-current mains. It is in the circuit all of the time, yet it will not cause a visible movement of the electric-meter disc until the secondary which supplies the ordinary battery bell with current, is brought into

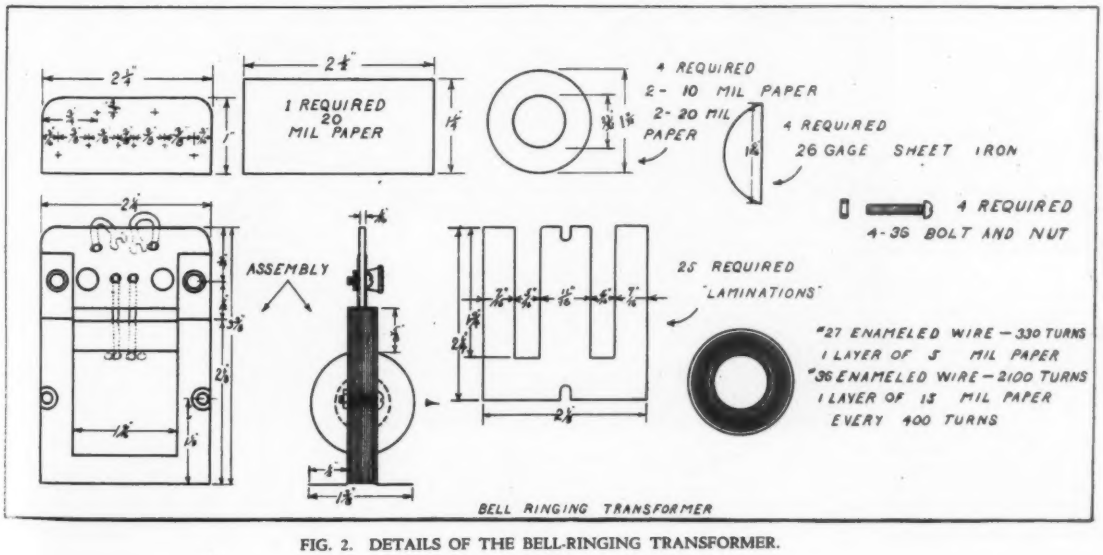


FIG. 2. DETAILS OF THE BELL-RINGING TRANSFORMER.

use. Then the meter will register about five watts while the bell is ringing. If the transformer heats up, it is an indication that there is a short in the secondary, which is usually the external circuit.

The amount of the secondary voltage is calculated in this manner. There are 300 turns in the secondary and 2100 in the primary, therefore the secondary will have something like one seventh of the primary voltage.

(Copyright 1927 by Wynne L. McDougal)

THE MINNESOTA VOCATIONAL ASSOCIATION MEETING

The Minnesota branch of the American Vocational Association is completing plans for the fall meeting of the association to be held in November. Among the interesting projects to be taken up in connection with the program are the following:

a) A roundtable program in connection with the Minnesota Education Association, to be conducted jointly by the general industrial section and the vocational education section. At this roundtable will be discussed methods and devices by C. A. Bowman of Stout Institute.

b) Commissioner John J. Tigert of Washington has been secured for an address at the first annual dinner of the Association to be held in November.

c) At the second annual banquet to be given for superintendents and foremen of industrial establishments at the St. Paul Vocational School, Mr. C. F. Foster will be the speaker. Mr. L. R. S. Ferguson will act as toastmaster.

d) Commissioner Tigert will make two addresses in the interest of trade and industrial education during the Minnesota Education Association meeting. One of these addresses will be made at the joint session of the industrial education and vocational education sections.

PRESIDENT LEE'S A. V. A. LETTER

In many ways the program for the Los Angeles meeting promises to be stimulating. There is one session in which I am particularly interested because at that meeting we are going to give real meaning to the term "American" as it relates to our association. I refer to the banquet meeting which we have decided shall be representative of all America. To this end we have invited a representative from Canada, one from Mexico, and one from the United States to appear on the program. The idea for such a meeting had its inception in certain remarks made by the delegation from Canada which waited on the executive committee in Louisville at the meeting set aside for receiving invitations for the next convention. The gist of these remarks was that Canada expected very soon to invite the American Vocational Association to meet in Toronto, and that acceptance of such an invitation would do much to advance vocational education in the Dominion. The delegation also brought out the fact that we might expect very shortly to receive applications for affiliated membership from certain of the provinces, which applications—if we are truly an American vocational association—ought to be approved in exactly the same way as applications from the states in the United States were approved.

The earnestness of the Canadian representatives, of whom there were three, and the inescapable logic of their statements had a profound effect upon the executive committee. Even for those who had visioned the scope of the association's activities in the broadest of terms the name "American" took on added meaning, and it was easy for the thought of an American program to take root and grow.

Accordingly, in due time I wrote to the director general of vocational education for Canada, inviting him to participate. The response was immediate and favorable. At the same time a letter was sent to President Calles of Mexico urging him to send officially some member of his governmental family to speak for our neighbor to the south. The response was not immediate, but it was most interesting. At the summer session at the University of California this year there was held an assembly for international studies, in which the chief emphasis was laid on relations between the United States and the Central American nations. To this assembly came the Honorable Moises Saenz, subsecretary of education for Mexico. My letter to President Calles had been referred to him, and we talked it over in my office. The director of vocational education for Mexico will represent his country at Los Angeles.

The chairman of the Federal Board for Vocational Education, Mr. James J. Davis, Secretary of Labor in the cabinet of President Coolidge, has been requested to speak for the United States, and it is my hope that he will accept.

It is apparent that the meeting just described has within it boundless possibilities. The realization of the vision of a movement for vocational education which shall in truth be completely American in its aspects is indeed possible. There is the possibility of an increased international good will which always comes when men sit down to discuss common problems. There is the possibility of each of us learning much concerning the problems of vocational education when we approach them from the viewpoint of another national group. I am convinced that no session at the Los Angeles meeting will eclipse in significance the American meeting.—*Edwin A. Lee, President.*

HOLD SIXTH ANNUAL PRINTING CONFERENCE

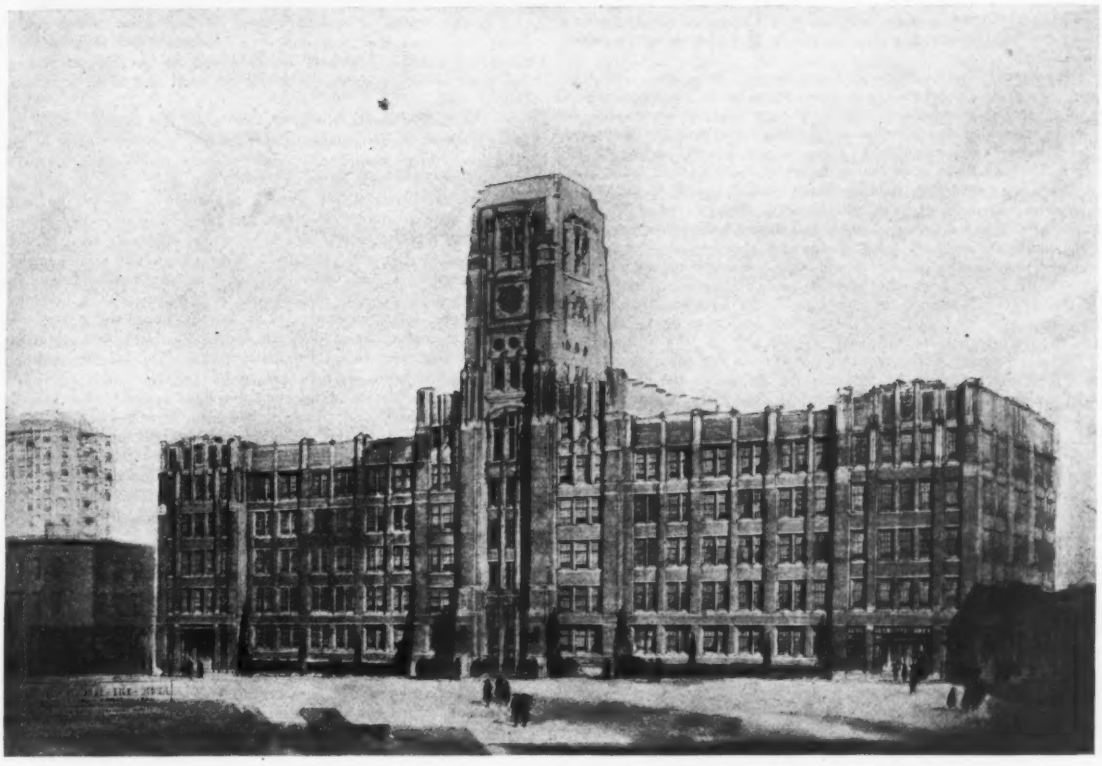
The sixth annual conference on printing education was held June 27 to 29, at the Typothetae School of Printing, Indianapolis. Between 75 and 100 teachers of printing and persons interested in the subject were present at the sessions, as well as 75 master printers from the city of Indianapolis.

The principal speakers at the opening session were Mr. Charles Francis of the Francis Press, New York City, and Mr. E. P. Nickel, of the Southern School of Printing, Nashville, Tenn. Other well-known speakers were Mr. Z. M. Smith, state director of vocational education in Indiana; Mr. H. G. Martin, director of the Delgado Trades School, New Orleans, La.; Mr. Martin Heir, of the Inland Printer; Mr. E. E. Sheldon, of the Lakeside Press, Chicago, Ill.; Mr. R. W. Polk, of the Robidoux Polytechnic School, St. Joseph, Mo.; Mr. Herbert Warfel, of Joliet, Ill.; Mr. Allan Robinson, of Baltimore, Md.; Mr. S. M. Purinton, Oak Park, Ill.; Mr. E. C. Raasch, of the Boys' Technical High School, Milwaukee, Wis.; Mr. C. W. Hague, of the Stout Institute, Menomonie, Wis.; Mr. Frank Rhodes, of the Canadian School of Printing; Mr. M. W. Haynes, of the American Type Founders Co., Jersey City, N. J.; and Mr. Thomas Knapp, of the Mergenthaler Linotype Co., Chicago, Ill.

It was decided that the next meeting should be held June, 1928, at the Carnegie Institute of Technology, Pittsburgh, Pa.

THE ONLY RUBBER SCHOOL IN THE WORLD.

At the Northern Polytechnic, Holloway, N. England, there is a unique class, or rather workshop where young boys produce rubber goods, such as cricket bat grips, cricket balls and everything that can be made from rubber. This is the only rubber school in the world and after the boys have completed two years' training they are guaranteed work in big rubber factories. The boys handle the rubber from its first raw stage and the process they make with it is made with the most up-to-date machinery which they handle themselves. The photograph shows students at work, one cutting raw rubber and the other mixing chemicals to be mixed with same. —Keystone Photo.



PERSPECTIVE SKETCH OF THE PROPOSED VOCATIONAL HIGH SCHOOL, MINNEAPOLIS, MINN.

THE NEW MINNEAPOLIS VOCATIONAL HIGH SCHOOL

Delia Milstead, Minneapolis, Minnesota

Herewith is shown the architect's sketch of the new Minneapolis Vocational High School. The building will be five stories high, surmounted by a massive tower. The first four stories will be occupied by the Girls' Vocational School, and the fifth floor by the administrative offices of the board of education. A portion of the tower will be occupied by the architectural department. The total cubage of the building is 3,216,000 cubic feet.. Construction will be of skeleton reinforced concrete with curtain walls of brick, and Bedford stone trimming.

On the ground floor at one corner of the building will be a completely furnished store with facilities for training in window dressing, salesmanship, and all other aspects of retail work. Its stock will consist of children's clothing, lingerie, and millinery made by students of the school. In this same suite, there will be a room with equipment for making chemical and strength tests of materials, tubs for dyeing, microscopes, and other apparatus for the study of all textile materials handled in retail stores. Another room will be devoted to the study of design in fabrics, and will contain art tables, cabinets, and manual-training benches. A third room will be used as an assembly room for the department.

To answer the demand for workers in cafeterias and tearooms, there will be a commercial cooking department for the training of waitresses, pantry girls, cafeteria helpers, and cooks. The tearoom on the ground floor will be open to the public and will accommodate seventy patrons. There will be a private dining room for parties, committees, and the training for home service. In the basement will be a modern cafeteria where students may obtain their luncheons. The adjoining kitchens, storerooms, and laundry will serve as classrooms in training for cafeteria management; and a large laboratory will enable prospective cateresses to fill orders for all kinds of food.

The business department will consist of a telegraphy room, with all the equipment of a standard telegraphy office; an advanced bookkeeping room, with modern bookkeeping machines; a calculating room equipped with 25 comptometers; and an office-training room equipped with dictaphones and complete facilities for the study of scientific filing. These special rooms, with a full complement of stenography, English, and arithmetic classrooms, will enable boys and girls to secure short, intensive training in commercial work.

Two power-machine rooms will be provided. The first, to be used for beginning students, will be equipped with smoothly running, high-geared stitching machines, and the second, with double-needle machines, sergers, hemstitchers, and finer stitching machines designed for work on silk and rayon. By these means, there will be an opportunity for not only the regularly enrolled day students, but also for special students to become acquainted with special types of machines.

Two well-equipped chemical laboratories will be used, not only to develop the related science for each vocation, but also to furnish work places for students in extension classes that desire to master chemical knowledge necessary for successful workers in the chemical laboratories of laundries and in plants manufacturing paint, linseed oil, drugs, and glue.

On the first floor will be located the nursery school. Every mother who sends a child to the school will send with him an account of what he has eaten in the morning and what will be prepared for his supper. The diet girls must not only prepare the one meal, but must make a careful study of what each child must have to supplement the amount and kind of food served at the other meals. A big playroom, furnished with a piano, kindergarten chairs and tables, sandboxes, slides, toys, flowers, and goldfish, will be an attractive place in which to learn how children react to one another, how social habits can be cultivated, and antisocial tendencies checked under special guidance.

One small workroom, with a possibility of more space later on, will be set aside for the training of beginners, both boys and girls, in jewelry manufacturing. Jeweler's tables, fitted with file bins and pans for catching the scraps, arm rests, tool drawers, and individual lights, will be adequate for work in piercing and sawing. Repair benches, with torches for soldering, engraving tables and tools, a lathe, an electric grinder, drill press, and small polisher will make possible the completion of simple pieces of jewelry.

A darkroom, large enough for six or eight workers is equipped for amateur and semiprofessional photography. School-owned cameras for laboratory and interior work, printing frames, printing machines, retouching frames and instruments will make up the major part of the equipment.

The bookbinding room, beautifully lighted from two sides, will have floor space ample for worktables, presses, backing machine, table shears, paper cutters, sewing frames and machines, embossing tables, glue pots, and a ruling machine. Advanced work in leather and in special bindings will be done. The printing room is divided into a composition and a pressroom. The equipment will be up to the standard of commercial printing establishments of the city for the type of work that is to be undertaken.

A small but complete library; a study hall; a girls' gymnasium, fully up to the standard of the gymnasiums in other schools and an auditorium designed to hold 1500 people, with stage and dressing rooms adequate for caring for all of the school functions, will contribute to the life and spirit of the school.

The administration suite will house the coordinators, vocational counsellor, and hygiene director, as well as the administrative officers of the school.

Throughout the building, arrangement has been made for night classes, as well as day-school classes. A special office has been designed for the night-school principal, special storage space in each room for the night-school teachers, and a checkroom for caring for the wraps of night-school students. The library, gymnasium, cafeteria, and study halls also will be open for night-school students.

The placement office for the entire school system is situated at the right of the main entrance on the main floor. This will link up the work of the placement department with vocational opportunities open to students from all parts of the city.

Upon completion of the second unit, the training facilities for boys will be moved from the present East Vocational School to the new building. Thousands of boys and girls between the ages of sixteen and eighteen, who have left school and who have not as yet made their adjustment in industry, will be able to take advantage of the facilities offered as the seasonal possibilities for their employment vary. The impressiveness of the structure, as well as the completeness of the training program, will do much to establish in the minds of youth and adults alike, the dignity and importance of labor.

FORWARD IN REVERSE

T. N. Rogers, Los Angeles, California

Some of the everyday problems of the shop instructor are, and must be, as unchangeable as the laws of the Medes and Persians. But in all problems there exist some variables which can be readily solved and which make the work more interesting.

For the shop instructor, one of the bothersome and ever-present problems is the frequent question from the pupil, "What shall I do next?" Perhaps this question is most aggravating in prevocational classes of 9B pupils. The majority of these ninth-graders are unsettled, physically and mentally; they are changeable in their interests and desires, frequently careless and indifferent of the qualities of their work, more or less nervous and quite frequently seeking changes in their activities. The jobs undertaken by these pupils must be relatively short, not too difficult, and the element of interest must depend upon, to a considerable extent, to carry the boys through the difficulties of learning.

The writer's 9B class offers a finding course in which a number of activities of a mechanical nature are carried on during a semester of 20 weeks. The course resolves itself into a series of semifixed problems or projects of the constructive type. As little work as possible of a nonconstructive nature, or which does not contribute to an individual or collective product, is included. The classes average 25 boys with no more than five working at one job or one type of activity. The reader undoubtedly understands that in such a situation the question, "What shall I do next?" is frequent and involves a problem that must be properly handled.

Briefly stated, a simple system of instruction sheets has been found to reduce the questions to a minimum and to keep the boys actively engaged. The plan is not based on the Dalton system but has been developed gradually to fill the need and to fit a definite system of jobs.

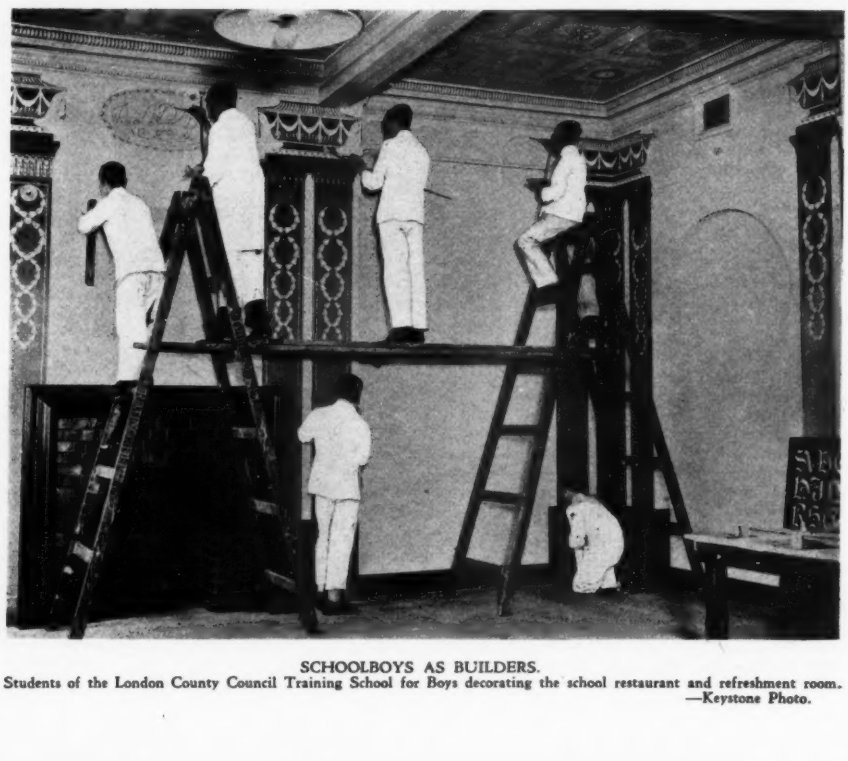
The lesson sheets are given out after the demonstration and in my experience help the boy remember the essential points of the instruction. They insure that each student comes into contact with the basic facts which he must know, and they make it possible that each student entertain the same thought about the job he is doing, at least to the extent of suggesting how he can obtain the correct answers to most questions which he would otherwise ask. The lesson sheet goes farther and provides a means by which each student may continue to work and waste as little time as possible during the interval when he may be waiting for the instructor to criticize his job and suggest corrections, etc. The lesson sheets are a cure for the problem of the question, "What shall I do next?" in that they say, "Here is your job; follow the instructions. Think a bit, and you can do all that is necessary."

Every new device in teaching develops troubles all its own. The lesson sheets have their faults. We find that they must be written in the simplest language. The majority of 9B boys do not understand so simple a direction as "Now measure the distance between the centers of the circles." Our lesson sheets based on our experience require the interpretation of shop language. The boys are required as a distinct part of their jobs to consult the classroom dictionary for such terms as equidistant, dado, etc.

Do lesson sheets make less work for the instructor? They certainly do not, but they remove a great deal of the worry, and they increase the efficiency of instruction. Every student has sufficint information to carry out each job according to a logical plan. The instructor is saved many words of explanation to most boys who understand the written instructions. Boys who are backward or difficult, receive the attention which they deserve, without sacrificing the time of those who are capable and ambitious.

What about the questions which must be answered in the lesson sheets? Do the boys copy from one another's papers? Yes and no. Rarely more than three boys ever have the same question to answer at the same time. Secondly, when questions are correctly answered, the boys must give evidence that they understand the replies. Each boy must know why he is answering as he does, or find a boy who has completed the work and can give him the correct answer. As a rule, there is very little helping of this kind.

Lesson sheets properly prepared and properly used do not reduce the duties of the instructor but rather systematize his objectives and his teaching method. Perhaps lesson sheets are a step backward toward academic methods in shopwork, but in reality they are a step in advance toward making the instruction concrete, comprehensive, and altogether efficient.



SCHOOLBOYS AS BUILDERS.
Students of the London County Council Training School for Boys decorating the school restaurant and refreshment room.
—Keystone Photo.

NEW BOOKS

Machine-Shop Science

By Joseph J. Eaton and Albert V. Free. Cloth, 181 pages, illustrated. Price, $1.48. Published by the Manual Arts Press, Peoria, Ill.

The authors of this book have succeeded in placing the scientific facts which underlie the work in the machine shop, in a very interesting and readable form.

Under the subject of mechanics are found the following: Measuring and measuring instruments; simple machines; strength of materials; force, work, and energy; and motion.

The subject of heat embraces: Softening and annealing, tempering, brittleness, expansion, and shrinkage.

Under chemistry are found such headings as: Iron rust, case-hardening, pickling, plating, combustion, and brazing.

The work is arranged in the form of experiments. Each one of these is introduced by a brief explanation. The method of performing the experiment is then outlined, and numerous practical questions and problems are added.

The appendix contains additional problems, and a number of useful tables.

Veneers and Plywood

By E. Vernon Knight and Meinrad Wulpi. Cloth, 372 pages, illustrated. Published by The Ronald Press Co., New York City.

The authors of this book have seemingly spent a vast amount of time to trace the history of veneers and plywood. The result is about one hundred pages of interesting historical reading which is but slightly impaired by the authors' penchant for making derogatory remarks about those peoples and ages in which veneer or plywood was not extensively used.

The balance of the book treats the subject from the manufacturing standpoint and is both thorough and good.

Machine-Shop Practice

By Harry A. Jones. Cloth, 172 pages, illustrated. Published by Thomas Nelson & Sons, New York City.

This is a book which will be found very useful by the machine-shop instructor who wants to use unit lessons. It is profusely illustrated. Besides the shopwork, some applied shop mathematics, science, heat treating, a glossary of terms, and a number of useful tables are to be found in the book.

The work is arranged under the following headings: Benchwork, drilling, lathework, shaper, milling, and grinding. The tool processes are described in a thoroughly practical manner.

While the book does not attempt to treat the subject exhaustively, the machine-shop instructor will find it thorough enough for all practical purposes.

Preparatory Mathematics for the Building Trades

By H. B. Ray, A. V. Doub, O. F. Carpenter. Cloth, 12 vo., 68 pages. John Wiley & Sons, New York, N. Y.

This book is based on the assumption that the apprentice in the building trades and the young tradesman require a restatement of the arithmetical method of using common and decimal fractions, of computing areas and volumes of simple figures, of computing powers and roots, and of handling the right triangle. In addition to these basic processes and applications, they require some familiarity with the steel square and with simple but typical applications to stairs and plans. The present book is compact yet remarkably complete and contains a sufficiency of problems taken from real jobs to make principles and methods usable. Tables are appended.

General Chemistry

By Thomas P. McCutcheon and Harry Seltz. Cloth, 417 pages. Price, $3.50. Published by D. Van Nostrand Company, New York City.

This book covers an introductory college course for general students and for men who are preparing to enter any one of the profession which require a background of chemical theory and a familiarity with the characteristics of the elements and their most widely useful compounds.

Introduction to Organic Chemistry

By Roger J. Williams. Cloth, 567 pages. Price, $3.50. Published by the D. Van Nostrand Company, New York Citv.

A college text for students who expect to enter medicine, pharmacy, or professional work as chemists.

Standards of the Hydraulic Society.

Paper, 80 pages. Illustrated. Price, 50 cents. Secretary, C. H. Rohrbach, 90 West Street, New York.

This booklet is the fourth edition issued by the Hydraulic Society. It is profusely illustrated and contains a great deal of valuable information on definitions of hydraulic terms; classification, description, and directions for installing the various types of pumps; notes on making and computing pump tests tables of materials for pumps designed to handle different liquids; and a number of tables, curves, and formulas.

INDUSTRIAL-EDUCATION CONFERENCE

The division of industrial education, State Teachers College, Santa Barbara, California, held an industrial-education conference on Saturday, June 30, 1927. The conference was called by E. E. Ericson, director of the division of industrial education.

Group conferences were held on problems in vocational guidance, problems in shopwork below senior high school, problems in shopwork in part-time schools, and using facilities of industry in vocational training. These conferences were presided over by Dr. A. H. Edgerton, professor of industrial education, University of Wisconsin; Benjamin W. Johnson, assistant director of vocational education, University of California, Los Angeles; Vierling Kersey, assistant superintendent of schools, Los Angeles; George D. Henck, supervisor of manual arts, Pasadena.

At the closing dinner, the conference was addressed by Nicholas Ricciardi, state commissioner of vocational education; Charles A. Bennett, editor, *Industrial Education Magazine;* and William John Cooper, state superintendent of public instruction.

NOTED EDUCATOR AND ENGINEER DIES

The recent death of Dr. Arthur A. Hamerschlag, first president of the Carnegie Institute of Technology, closes the career of a pioneer in this school of technology. His share in the work of creating and developing the Carnegie Institute of Technology was unique and stands as a monument to his philosophy of this phase of industrial education.

DR. ARTHUR A. HAMERSCHLAG.

Dr. Hamerschlag was born in Omaha, Nebraska, November 22, 1869. He received his early education in Omaha schools and from private tutors. In 1907, the degree of doctor of science was conferred upon him by Lehigh University and also by the Western University of Pennsylvania, now the University of Pittsburgh. The honorary degree of LL.D. was conferred upon him by Trinity College and Allegheny College in 1912.

From 1888 to 1892, Dr. Hamerschlag was engaged in engineering work for the United States government in Cuba and Mexico. For a number of years he was superintendent of St. George's Evening Trade School, New York City. He was appointed director of Carnegie Institute of Technology in 1903 and was elected as the first president of that institution in the same year. In 1915, he served as a member of the department of education at the Panama-Pacific Isles exposition. He retired from the presidency of the Carnegie Institute of Technology in 1922, having held the position for 19 years. In 1923, he was elected vice-president and director of the Research Corporation of New York for a period of three years. The purpose of this corporation is to assist inventors in bringing their inventions into practical use. He also filled the post of director of industrial research in the field under Major General George W. Goethals. For some time he was engaged in an independent practice as a consulting electrical and mechanical engineer for corporations and industries.

Besides being a member of many civic associations, he was affiliated with the American Association of Commerce, the American Association for the Advancement of Science, the American Federation of Arts, the Society for the Promotion of Engineering, and the Engineers Society of Western Pennsylvania.

The steady and rapid growth of Carnegie Institute of Technology upon the foundation which he helped to lay is an eloquent tribute to his ability. He died in New York City, following an operation for intestinal disorder, on July 20, 1927.

Dr. Hamerschlag made an outstanding place for himself in the history of engineering and of technical education.

NOW, ARE THERE ANY QUESTIONS?

Diluting Shellac

723. Q.: Will you please advise me why diluting or thinning shellac with wood alcohol causes the mixture to curdle?—*L. J. E.*

A.: Wood alcohol should not be used at all for this purpose, principally because of its extreme toxic effect. I had one experienced painter go blind at one time while working for me in a small room, and using the wood alcohol without my knowledge.

So far as the curdling is concerned, this is the wrong designation for what occurs, but the explanation is too technical to be worth discussion here. Fundamentally, there is a condition in the shellac due to improper manufacture which causes this precipitation. If the inquirer will get denatured alcohol from the paint store and ask for formula No. 5, he will have no further trouble in this respect. Do not use any of the antifreeze alcohols sold by the gas stations, due to the large kerosene content, which will cause the shellac to become gummy.—*Ralph G. Waring.*

Manual-Training Contests and Exhibits

730. Q.: I would like to know if you have any material, books, or information relative to methods of conducting contests in manual-training classes; also, material on the arranging of exhibits of manual-training work.—*S. M. D.*

A.: Information on manual-training contests and exhibits is scattered throughout the news pages of magazines devoted to industrial arts and manual training. Three kinds of contests have been most popular in recent years:

1. *Bird House-Building Contests.* These have been conducted in most cases by schools, sometimes by organizations of businessmen, and again by local branches of the Audubon society or some other organizations interested in the preservation of bird life. Usually local business people have been asked to provide prizes. The exhibits have been held in school buildings or local halls, or in business houses.

2. *Model-House-Building Contests.* These have had various objectives and have been conducted usually by local chambers of commerce or real-estate boards, in cooperation with the school authorities. The prizes have been offered by local businessmen and the exhibits have been held in a gymnasium, in the auditorium of a school building, or in some public hall. The "Tiny Town Exhibit" at Springfield, Missouri, has been an outstanding example of a model-house-building contest, the objectives of which have been to interest pupils and their parents in better house design and construction and home ownership.

3. *Model-Boat-Building Contests.* These have been held in cooperation with local organizations of yachtsmen and businessmen and a feature has been not only the shopwork but also races of the models.

The possibilities of interesting pupils through contests has hardly been touched. There is no reason why there should not be contests in toymaking, in furniture making, in printing. To illustrate: a contest in printing might take up the setting of a piece of copy for a letterhead, a title page, or a business card.

Exhibits

The types and varieties of exhibits of manual-training products is almost endless. We have seen all sorts of exhibits lasting from a day to a week, and ranging in size from a collection of five or six small pieces to a great circus or fair housed in a tent and including 10,000 to 12,000 pieces.

Among the specific types of exhibits might be mentioned:

1. Annual Exhibits at the Close of the Year.

2. Christmas Exhibits for the Sale of Toys and Other Products Made in the Schools.

3. Red Cross Exhibits, the proceeds of which go to the local Red Cross organization.

4. Charity Exhibits of Products Made in the Schools, and sold for the benefit of a local charity organization.

5. Bird House Exhibits (discussed above).

6. Boy Achievement Week Exhibits. Probably the best show of this kind is held annually by the Chicago schools.

7. Convention Displays of Articles Made in the Manual-Training Shops and collected for local, county, state, and national conventions.

8. Special Trade Exhibits. In some communities the schools cooperate with local industries by making displays of school-made products at trade conventions. Some of the more progressive organizations like printers, etc., are anxious to show school products and teachers might well take the initiative to get in touch with local committees of conventions.

9. Window Displays. A display of manual-training products in a popular downtown store reaches many persons who would not go to a school to visit an exhibit.

10. Open House Displays. Many schools have found an annual open house day valuable. A good display on an occasion of this kind is particularly useful.

11. Permanent School Exhibits in the Lobby or School Headquarters. These are interesting and useful, provided they are changed at least once each year. This type of exhibit is always in danger of becoming a museum of ancient relics.

12. State Fair and County Fair Exhibits. These reach people who could not otherwise be reached and have advertising value.

The schoolman who has an eye for the growth of his department or school will make sensible use of exhibits as a means of providing an incentive for better work on the part of the pupils, and also of convincing the community of the value of what he is doing.

Finishing Lacquer Work

732. Q.: I read Mr. Ralph G. Waring's article in the April issue on lacquer, and found some valuable helps in it. Was not successful with the polish for which he gave a formula. Could you tell me just what he means by "crude oil"? I used something they called "shingle oil," but it seemed to gum up everything.—*C. W. B.*

A.: Crude oil is the petroleum material as it comes from the well, and should not be confused with the shingle oil which is a by-product of gas manufacture. The latter oil has a creosote content which gives trouble in polishing. Substitute the neutral oil which may be purchased in any drug store.

As a final clean-up on lacquered surfaces, use a clean piece of cotton flannel, containing the vapors of alcohol only, to remove all traces of oil and leave a hard, bright surface.—*Ralph G. Waring.*

Finishing Domestic-Science Table Tops and Meat and Bread Boards

733. Q.: We are finishing up a group of ten domestic-science tables having birch tops and basswood meat and bread boards. The tops and the boards are to be finished in the natural without varnish or shellac. What shall we put on them to make them sanitary and as waterproof and greaseproof as possible? Finishing in linseed oil has been suggested. Is this the best?—E. M.

A.: Do not use shellac, varnish, or linseed oil for the table tops and slides. My own experience is that none of these is satisfactory; especially the first and last which rapidly go from bad to worse. What is necessary is a material which will dry with great speed, wear reasonably well, permit easy cleaning as well as easy renewal.

These attributes are easily found in Pratt & Lambert's No. 61 brushing lacquer. In its application, the lacquer should be brushed freely onto the cleanly sanded wood with a two-, three- or four-inch fitch or bear brush. A Wooster "Shasta" brush is fine for fast work on all flat work but my personal preference is for the fitch brushes. Allow the first coat to dry at least half a day; sand with a split 6/0 garnet paper, dust off and apply another coat of lacquer. No further sanding is necessary for succeeding coats. As many coats may be used as is considered necessary to bring the work up to the desired finish. Allow an overnight dry after which the work may be sanded smooth with 8/0 wet or dry paper and gasoline, to a perfect finish These specifications will compete favorably with the best two- or three-coat contract varnish jobs for less than two thirds the cost. Oil off with paraffin oil when through sanding.

For refinishing, clean the work with a rag saturated with denatured alcohol and wipe dry with a clean rag. Dust off and relacquer. Thus the work can be washed Friday afternoon, dried in thirty minutes and lacquering started immediately. This will set the job ready for Monday morning. It will stand up fine in service.—*Ralph G. Waring.*

Reorganize Curriculum at Pullman Technical School. The course of study at the Pullman Technical School, Chicago, Illinois, has been reorganized to give more time for vocational work.

Under the new plan prepared by Principal U. G. Willis, twice as much time is to be given to vocational work as in the past, and no attempt will be made to prepare students for college. During the first year boys will spend 75 hours in each of the following departments: mechanical drawing, machine shop, automechanics shop, and electrical shop. At the beginning of the second year boys will elect one of the shop courses, and during the second year half their time will be spent in that course and half in academic work. During their third and fourth years, three fourths of their time will be spent in the shop course that they have elected, and the rest being devoted to related work.

It is planned to admit to day and evening courses next year a considerable number of adults of both sexes for short vocational courses, giving each the particular kind of training desired.

Stanley Steel Square No. R100. Specify the letter "R" for full rafter markings.

A new booklet on the Steel Square

Free copy to instructors

Here is a booklet that tells how to use a steel square —in simple language that your boys can understand.

This book was written by L. Perth, Local Union No. 10, of Chicago, an expert on building construction. It explains the few simple rules of operation in a manner very easy to understand. The table of contents, shown on the right, gives the wide range of subjects it covers. Every instructor should have a copy for reference. Sent free on request.

In schools where roof framing is taught we will be glad to supply reasonable quantities free for classroom use.

THE STANLEY RULE AND LEVEL PLANT
Educational Department, New Britain, Conn.

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INTRODUCTION

CHAPTER 1—The Square: Description of Square—Graduations—Tables and Scales.

CHAPTER 2—Roof Framing: Types of Roofs—Definition of Span, Run, Rise, Pitch—Definition of Plate and Ridge Board—Types of Rafters—Top, Bottom and Side Cuts—Measuring Line, Length, Tail and Length per foot run.

CHAPTER 3—Common Rafters: Definition of Length—Top and Bottom Cuts—Actual Length—Applying the Square.

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STANLEY
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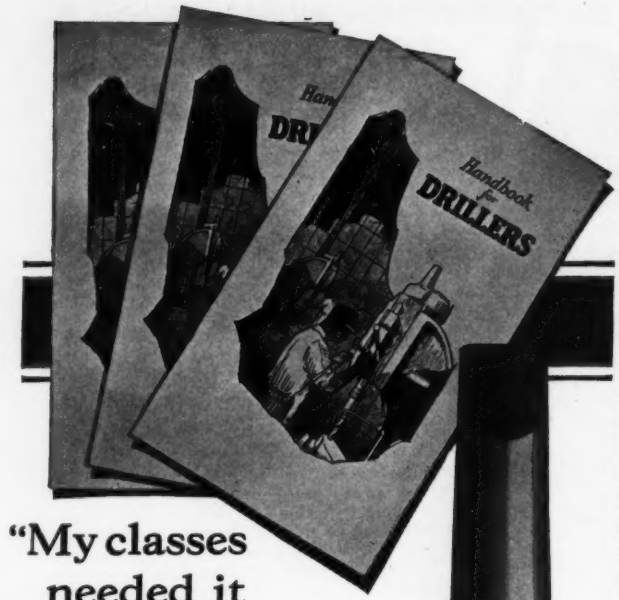
STANLEY TOOLS

STANLEY EQUIPMENT IS STANDARD EQUIPMENT



"My classes needed it badly"—

wrote an Eastern Instructor of Industrial Education, after receiving copies of the "HANDBOOK FOR DRILLERS."

"Not only does it contain the clearest and most concise description of the twist drill, how to grind it properly and how to use it intelligently, but its practical helps and hints make it an invaluable textbook for the student of machine shop practice."

The "HANDBOOK FOR DRILLERS" is written in a non-technical style, particularly for the use of students in High Schools, Vocational Schools, Technical Schools, Colleges, and by manufacturing establishments maintaining apprentice schools. It is printed in large quantities, and widely distributed by this Company, not as an advertisement to promote the sale of its products, but as its contribution to vocational education.

Copies of the "HANDBOOK FOR DRILLERS" will be sent to instructors, without charge, in any reasonable quantities for use as a textbook by the students in machine shop practice.

The CLEVELAND TWIST DRILL COMPANY CLEVELAND NEW YORK-CHICAGO-LONDON

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

NEWS AND NOTES

The vocational agricultural teachers of Indiana elected the following officers: President, Otis Crane, Marion; vice president, J. G. Zimmerman, Monticello; treasurer, R. L. Case, St. Joe; secretary, R. W. Gregory, Purdue.

Arts-and-Crafts Exhibit at Sewickley. The manual training, domestic science, art, and music departments of the high school, Sewickley, Pa., recently held an exhibit of the work done by the students for the benefit of the parents and the general public. The domestic-science department displayed attractive work in dressmaking, furniture decorating, fancy needlework, and lampshade making. The cooking classes had a display of cakes and other good things. The manual-training department had a collection of wood and metal handicraft, including porch swings, smoking stands, floor lamps, colonial clocks, bookracks, and footstools. The exhibit was arranged and conducted under the direction of Miss Rhea Stewart, domestic-science instructor, and Mr. Thompson, director of manual training.

Vocational Agriculture Course. The schools of Madison, New Jersey, during the past year carried through a successful experiment in vocational agriculture. A class of 25 boys took the course which comprised horticulture, landscaping, and greenhouse work. It is planned to extend the work next year to include eight weeks' work in agriculture for boys in the seventh and eighth grades.

Provide Enlarged Facilities for Vocational Work. Overcrowded conditions in the vocational schools at Cincinnati, Ohio, have made it necessary to provide additional facilities for this work. It is planned to move the Girls' Vocational School to a new location in the university building. Suitable locations will also be obtained for the printing trade school and the automotive trade school. A new location has been obtained for the vocational classes now held in the Washington building.

Vocational Education In Need of Trained Leaders. Vocational education in the United States has reached a stage where it needs men and women capable of leadership in its functions, according to Mr. J. C. Wright, director of the Federal Board for Vocational Education. Mr. Wright believes that some agency intimately concerned with vocational education should take the initiative in providing some means whereby these matters may be discussed freely and constructive suggestions made a matter of record. The Federal Board for Vocational Education, in his opinion, is the proper agency to act in a coordinating capacity in this matter.

Many educational institutions offer excellent training for leaders in the field of general education, but few of these are organized specifically to train leaders in the field of vocational education. These institutions might be able to do much to help supply the vocational field with adequately equipped leaders. Mr. Wright holds that there is a demand for trained leaders and that there will be a market for all who have the proper training. The present need is for training opportunities to meet the need of individuals now leading in existing positions, and to help those who may be called upon to lead in new positions which may be created.

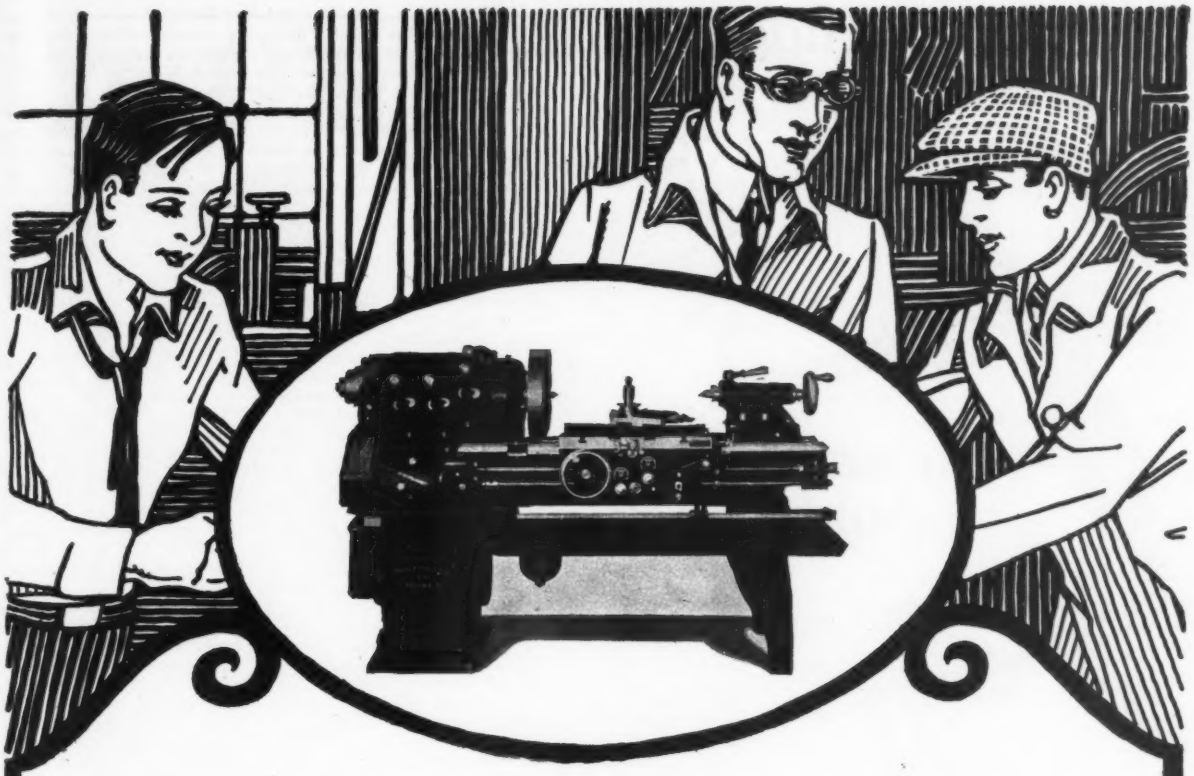
Progress of Industrial Education at Watertown. The Industrial Board of Education of Watertown, Wisconsin, has retained the present teaching staff, which consists of Mr. B. C. Trueblood, director of vocational education; A. L. Sours, coordinator and instructor in shop science and mathematics; Anna Kramer, Instructor in commercial subjects, English, and social science; Hilma Fondell, head of the home-economics department, and Gladys Galaske, assistant in the latter department.

The development of the social life of the school is in the hands of the home-economics teachers who have charge of the girls' club work. Through their work the teachers have established a closer relation between the homes and the school by means of visits to the parents. The school has closed a profitable year which has been noticeable in the increased attendance of both day and night schools, and in the per cent of attendance which has been better than in former years.

Beloit Vocational School Holds Graduation Exercises. The vocational school at Beloit, Wisconsin, held its graduation exercises on July 16, with the home economics, commercial, and mechanic arts departments taking part. About 25 girls took part in the home economics demonstration with each girl wearing a different colored dress. The typing demonstration was carried out by part-time and full-time students with the aid of a victrola. The making of the vise was a practical demonstration and included equipment for each part. The office number was a practical demonstration in the employment of office boys. The entire program was carried out successfully under the direction of Mr. A. G. McCreary, director of the vocational school.

Announce Gas Engineering Course. The gas engineering department of Johns Hopkins University, Baltimore, Md., has issued an announcement concerning the third year of its department of gas engineering. The department offers a coordinated curriculum for both undergraduate and graduate students, with university degrees for those who successfully complete the courses. The department seeks to supply the demand for trained employees in gas engineering and with

(Continued on Page 30a)



Train Your Students for Their Jobs — Use MONARCH LATHES

Train your students on MONARCH LATHES and when they go from your school they will be ready for their jobs —valuable men immediately without the necessity of going through another period of training in the shop.

The student that is trained on a Monarch Lathe is trained in actual shop practice — for the Monarch is the first choice of Industrial America. Today more Monarch Lathes are being sold to industrial plants than any other lathe built.

The Monarch motor-driven, helical geared Lathe is the ideal equipment for instructional purposes. It is far in advance of other lathes in design. It is as near danger-proof as any lathe can be made. It is as noiseless as any lathe can be—an important advantage in the instruction room.

Monarch Lathes are used in the Massachusetts Institute of Technology, Yale, Cornell, and in hundreds of the best technical and high schools — proof that the Monarch is the practical lathe for modern school equipment.

The success of your school and the success of your students are inseparably linked together. Use MONARCH LATHES and meet the modern demand for training that *fits men for their jobs.*

Illustration above shows 14 x 6 helical geared Monarch Lathe

THE MONARCH MACHINE TOOL CO.

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to keep it from turning back on ratchet movement. The famous "YANKEE" Ratchet is smooth, powerful, silent; as easy-working as the stem-wind of a watch, yet unbreakable.

See "YANKEE" No. 2100 — the finest bit-brace ever made. Try it and you will appreciate the economy of paying a little more to own a tool of this kind.

Hard Rubber Handles. Unbreakable. Do not warp, shrink, crack or bind. Top handle steel-clad, ball bearing. Sweep handle caps held by patented "YANKEE" method, preventing excessive handle play.

"YANKEE" Finish.—Nickeled and finished in keeping with the perfection of its construction.

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New "YANKEE" Chuck. — Ball bearing. Quick centering and accurate. Won't loosen in work with any bit; round, square, taper, ½ in.

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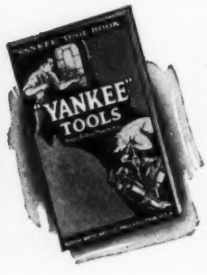
This interesting little book is for all lovers of fine Tools. It tells just what you want to know about all the famous "YANKEE" Tools. Write for your copy today.



Some Other "YANKEE" Tools

Ratchet Hand Drills — Ratchet Screw Drivers
Automatic Feed Bench Drills — Ratchet Tap Wrenches
Automatic Push Drills — Vises, with Removable Base

Dealers Everywhere Sell "YANKEE" Tools

NORTH BROS. MFG. CO., Philadelphia, U.S.A.

"YANKEE" TOOLS

Make Better Mechanics

(Continued from Page 28a)

this idea in mind has issued a descriptive pamphlet telling about the inception and scope of the course and the requirements for graduation.

Some New Provisions for Vocational Work at Somerville. The school board of Somerville, Mass., during the past year, made some new provisions for extending the work of the vocational department. Among the changes were two additional courses in electricity and carpentry for the boys' vocational school. The electrical work is carried on in one of the vocational schools and now has an enrollment of 24 boys. At present work is done mainly in the school plant but it is planned later to offer strictly trade work. The carpentry work seeks to provide trade training and the work is largely of a commercial character. Considerable experience was gained in the building of workbenches for one of the manual-training shops of the Western Junior High School. The school now offers five lines of trade instruction. It offers good academic training and trade experience for apprentices and the graduates have no difficulty in securing satisfactory positions in the industries.

Discontinue Vocational Courses at Decatur. Vocational agriculture for high-school students, personnel direction, and vocational guidance have been discontinued at Decatur, Ill.

Operating Jobs or Jobbing Operations. Published by Kuns and Christy, Withrow High School, Cincinnati, Ohio. The booklet contains job operations for the automotive trades and battery work.

Judging Dairy Cattle. Circular No. 99, April, 1927, issued by the U. S. Department of Agriculture, Washington, D. C. This pamphlet prepared by A. B. Nystrom of the Bureau of Dairy Industry, and C. H. Schropmeyer, specialist in agricultural education of the extension service, discusses the judging of dairy cattle, the use of the score card in scoring, the choosing of the animals to be judged, methods of observation, and placing.

Standards for Pumps and Pumping Machinery. The Hydraulic Society, comprising the leading manufacturers of pumps and pumping machinery, has just issued a new fourth edition of Standards for the Manufacture of Pumps and Pump Parts. The publication contains complete engineering details and should be a part of the working library of every superintendent of school buildings. Copies may be had at the nominal price of 50 cents from C. H. Rohrbach, Secretary, 90 West Street, New York City, N. Y.

Pamphlets Available. The Pan-American Union, Washington, D. C., has recently published a series of booklets on the South American republics, their cities, and their products. Eleven of the booklets relate to commodities produced in Central and South America. The pamphlets sell at prices ranging from 5 to 25 cents and are suitable for supplementary work in elementary and secondary schools.

Student Printshop at Nevada, Mo. A student printshop was successfully operated at Nevada, Mo., during the past year. The shop had charge of the printing of the school paper and also did a great deal of the job printing for the schools. All of the work was done under the supervision of the journalism department. The class had a capacity enrollment, with a waiting list of students who could not be accommodated.

The International Congress of Art Education. The latest word received in the United States concerning the International Congress of Art Education indicates that the meeting will be held from August 1 to August 8. Mr. Royal B. Farnum, principal of the Massachuetts School of Arts, Boston, heads the American committee. The congress is an international convention of members and delegates from representative countries. The sessions consist of special addresses, section roundtables, and delegate conferences.

An exhibit of art will be held at the same time, consisting of art education, drawing, design, and industrial art.

Five Girls Win Homemaking Prizes. Five girl graduates of the elementary schools in New York City were the winners of the Schepp Homemaking Scholarships of $150. Each of the girls received $75 at graduation, and each will receive $75 upon the satisfactory completion of a three months' course in the junior or senior high school. The winners were selected as a result of a city-wide test in homemaking given in June under the direction of Miss Martha Westfall, director of homemaking in the schools.

Hand Tools Requested. The Museum of the Peaceful Arts, 24 West 40th St., New York City, has made a public appeal for ancient hand tools used in working wood or metal. Tools which are both significant and authentic are suggested.

Trade School to be Enlarged. The Central Printing Trades Continuation School of New York City has been materially enlarged to take care of the apprentices enrolled with the various employing printers and unions. The school board has just renewed a three-years' contract for the collective operation of the school. The school authorities supply the building, the teachers, and the necessary supervision for the school and the printing industry supplies the equipment, the materials, and supplements the salaries of teachers. Committees of the employers and unions act in an advisory capacity.

Exhibit Manual-Arts Products. During the recent N. E. A. convention at Seattle an extensive display of school shop and art

(Continued on Page 33a)

DIETZGEN

Universal Drawing Instrument Set No. 1056-C illustrated above is furnished in pocket case lined with silk velvet. Set contains one 5½" ruling pen, bow dividers, pencil and pen, 6" plain dividers, 6" compasses, combination lead box and key, both with extra needle points and metal handle for divider, pen and pencil parts. Dietzgen Repair outfits for Universal Instruments will service a large number of sets. The outfit illustrated below is especially designed for schools and will keep these sets in good repair every day in the year.

UNIVERSAL DRAWING INSTRUMENTS

ALL Dietzgen drawing instruments are made in our own factory and are standardized, both for producing high quality instruments at low cost and for the benefit of users who are thus assured long and satisfactory service through ability to secure fitting replacement parts at any future time. This service is extremely important to schools as they may secure accurately fitting parts at reasonable prices on short notice from any of our branches or large dealers.

Address our nearest branch for descriptive literature regarding drawing instruments and repair kits.

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FREE TO INSTRUCTORS

A complete treatise on the use and care of drawing instruments is furnished free to instructors for distribution in their classes at the beginning of the semester. This 24-page booklet is of unusual value, and is being used as a text-book by many instructors. Copies will be mailed upon request.

(Continued from Page 30a)

productions was held by the Seattle school system. The committee in charge included Mr. Henry W. Milholland, supervisor of manual training.

Part-Time School Exhibit in Martinez. As part of the homecoming day program of the Martinez, California, high school, the part-time department prepared an exhibit of its activities in its downtown cottage. Posters hung about the rooms showed some symbol of the occupations of the various pupils; for example, an oxford shoe indicated that the pupil was a shoe salesman; a milk bottle indicated that the pupil worked in a dairy. A display of dresses and other garments made by the girls showed not only skill in stitchery but also an ability of the girls to make over garments for themselves or for their younger sisters.

The entire cottage was cleaned, painted, and tinted by the boys and girls of the part-time school. The curtains and furniture were also made by the pupils. A complete kitchen equipment, radio sets, drawing materials, and commercial equipment showed some of the numerous activities of the school.

Nebraska Funds for Vocational Education. The total funds available for the Nebraska Department of Vocational Education for the biennium beginning July 1, 1927, are as follows:

Vocational education (Smith-Hughes) state funds—	
Wages and salaries	$ 28,500
Maintenance	8,500
Aid to schools	140,000
Federal funds	173,780
	$350,780
Civilian rehabilitation—	
State funds	$ 24,628
Federal funds	24,628
	$ 49,256
Total	$400,036

It is expected that a much larger amount will be needed for the expansion of the vocational education program in the state. Only a few new schools or classes may be approved for reimbursement during the next two years. If funds were available, the work could easily be increased fifty per cent.

Recognizing the value of courses organized on a vocational basis and the helpfulness of supervision from the state office, some schools have met the requirements and have been approved without reimbursement. The state department has encouraged the arrangement and the list of such schools is growing. When funds are available, these schools will be placed on the reimbursable list. While funds do not at present permit a large increase in the number of centers of vocational education, the work now in progress may be made more efficient.

Montclair Art Exhibit. The art department of the Montclair, New Jersey, schools held an exhibit of its work at the local art museum from May 25 to June 5, inclusive.

North Carolina Vocational Program Has Steady Growth. The program of vocational education in North Carolina which was inaugurated in 1917-18 after the passage of the Smith-Hughes law, will complete nine years of service with the close of the fiscal year. During this period, vocational education has become a permanent feature of public education in the state. There has been a steady growth in all phases of the work, and today there is a steady demand for teachers of agriculture, home economics, trade and industrial education.

The trade and industrial education program has been limited chiefly to extending vocational training to boys and girls who have left school and entered employment, and to adults who are actually employed in wage-earning occupations.

More and more school officials in the towns and industrial communities are recognizing their responsibility to the working person who desires further training in order to increase his vocational efficiency. In line with North Carolina's industrial and educational development, there are being conducted evening trade classes in practically all industrial activities, and each year ambitious tradesmen are offered an opportunity to study those things related to their daily employment.

The part-time class meets during working hours and the work is offered to those who have left school but are able to come back for an hour or two every day to better fit themselves for their work. Among the subjects offered in the part-time school are furniture making, building trades, hand-loom weaving, knitting, stenography and bookkeeping, retail selling.

The evening classes for trades workers are held outside of working hours and are most effective since they are designed to increase the efficiency of the person who has entered employment. Short units may be given to groups desiring special training along any trade or industrial line. Among the subjects offered in the evening classes are mill arithmetic, weaving and designing, plumbing, steam heating, sheetmetal, blue-print reading, carpentry, painting and paperhanging, bricklaying, upholstering, electricity, papermaking, auto mechanics, barbering, dressmaking, foreman training, printing, and railroad shopwork.

(Continued on Page 37a)

SCHOOL SHOP EQUIPMENT NEWS

For the Supervisor and Teacher who desires to keep abreast with news of new Machinery, Tools, Supplies, etc.

NATIONAL MACHINE-TOOL-BUILDERS EXPOSITION

What promises to be a very interesting machine tools and accessories exposition, will be held September 19 to 23 inclusive, at Cleveland, Ohio. Machine tools ranging from planers weighing 20 tons, down to internal micrometers which measure differences of .00025 of an inch will be shown. The exhibit will be of interest to shop teachers.

NEW MOTOR ON ARBOR PORTABLE SAW BENCH

The Gallmeyer & Livingston Co., of Grand Rapids, Mich., has designed a new motor on Arbor Portable Saw Bench that may be operated directly from the lighting current. This type of drive eliminates all belts and gears; moreover, the arbor is so constructed that dado head, and grooving saws may be used.

NEW GALLMEYER & LIVINGSTON SAW.

The 30 by 34-in. table is slotted to permit a removable throat piece to be inserted when special saws are used. This table may be tilted to 45 degrees when desired. A groove is machined on both sides of the table top to permit the use of a crosscut gauge on either side of the saw. This gauge may be quickly set at any angle and securely locked. The ripping gauge can also be used on either side of the saw; the slotted end of the table permits the gauge to be set at any desired point on the table.

A special motor equipped with oversize ball bearings has ample power to cut stock 2½ in. thick. The saw may be raised or lowered by the means of a hard wheel in front of the machine. Moreover, a starting switch is conveniently placed in front of the machine for the operator.

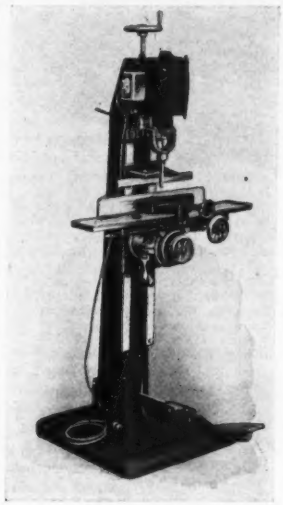
The machine is of sturdy construction being mounted on a one-piece pedestal, and so fitted with rollers that makes the machine easily portable. In addition, the machine is also made with a one horse-power motor to operate on a 220-volt power line, and with a larger saw the machine will cut stock up to 3½ in. thick. The saw is carefully guarded both with a splitter guard and with a guard that sets down over the saw to protect the operator.

This saw with its capacity, and refinements in operation, is a valuable contribution to the woodworking industry.

NEW OLIVER No. 194-D MORTISER

The Oliver Machinery Company of Grand Rapids, Mich., have developed a new portable motor-head hollow-chisel mortiser. Although portable, the machine covers a wide range of work, is compact, can be safely operated, and is of simple construction. However, it is efficient because of the direct motor drive which gives it speed and power. The machine is economically operated because it can be driven from a lamp socket.

The machine has practically all the production features of the larger machines. For example, a door-lock mortise may be made in the edge of a 36" door. Changes can be made from one kind of a job to another in a short time by means of adjustments at the table, and at the motor head. The table may be tilted to a 45 degree angle by means of an adjusting screw; also the table is of a compound type with clamp, and traveling capacity of thirteen inches. The machine will mortise in the edge of a 22 inch wide board with the table in place.



NEW OLIVER 194-D MORTISER.

The mortiser is of good construction, ball-bearing direct motor drive, back fence for alignment, and is so made that it may easily be converted into a boring machine if desired.

The machine requires a minimum of floor space, and is a new addition to the full line of portable machines built by the Oliver Machinery Company.

PEASE PARALLEL-RULE ATTACHMENT

The C. F. Pease Company of 802 N. Franklin St., Chicago, Ill., manufacturers of blue-print machinery and drafting-room supplies, has developed a parallel-rule attachment by means of which the old juggling T-square used on drafting-room tables may be entirely eliminated. The attachment is constructed entirely of metal, consists

LEFT—THE PARALLEL RULE ATTACHMENT APPLIED TO A DRAWING BOARD.
RIGHT—MECHANISM OF THE ATTACHMENT.

of only a few parts, and is so designed that the entire mechanism is underneath the table top, therefore never in the way.

An outstanding feature is that this attachment may be installed on any drawing table. It should be of interest to all drawing instructors.

New Boys' Trade School for Pittsburgh. The school board of Pittsburgh, Pa., has been asked to approve the architect's program for the erection of a six-story boys' trade school, to accommodate 2,400 students, and to cost approximately $1,500,000. The academic rooms will be located in the main six-story building, while the shops will be located in a single-story, toplighted factory-type building. In addition to this, it is planned to house the auditorium in a separate building, connecting it to the academic building at several floors. The health program will be taken care of in the auditorium or the academic building as seems most suitable. The plans for the structure are in the hands of Charles L. Wooldridge, Inc., of Pittsburgh, and the work on the same will be begun in the near future.

(Continued from Page 33a)

Will Support New York Continuation Schools. Pres. George J. Ryan of the New York City board of education has announced that the city expects to spend about $30,000,000 on continuation schools within the next few years, and that Mayor Walker has promised his cooperation in raising the money. President Ryan pointed out that the state has 150,000 employed children under 17 years of age who are in attendance on the continuation schools, and that of this number, 65,000 are in New York City. In 1921-22 there were 17,000 pupils enrolled in the continuation schools, while today there are four times as many pupils enrolled. In 1921 there was an appropriation of $500,000 for the work, and today there is an appropriation of $27,000,000.

New Textile High School. The board of education of New York City has been asked to approve a recommendation of the board of superintendents providing for the erection of a textile high school to take the place of the present inadequate quarters. The building will cost about $2,000,000.

The building will house between 2,500 and 3,000 students, will be five stories in height, and will have 65 standard classrooms in addition to the special textile trade-school features. There will be an auditorium, two gymnasiums, a library, and a cafeteria.

The plans provide for specially equipped shops for design, costume design, advertising art, graphic art, interior decoration, and three high artrooms. Rooms will be provided for art needlework, millinery design, machine sewing, hand sewing, draping, and dressmaking and fitting. Laboratories and shops will be included for textile testing, metal millwrighting, wood millwrighting, experimental dyeing, mechanical drafting, power weaving, hand weaving, spinning, and upholstery and furniture.

Vocational Survey at Alton, Illinois. The results of a vocational survey recently made at Alton, Illinois, are most interesting. The survey was made by means of a questionary which proved an index to the preferences of the boys and girls. Only 70 boys mentioned a preference for a trade, which is considered a low percentage. Four boys wanted to be clergymen and two had ambitions to be missionaries. More than half of the 850 pupils are girls. The number of vocations named was 102. These were grouped into 30 general classifications. Eighteen boys desired to be physicians, 16 lawyers, 11 architects, 4 dentists, 8 druggists, 100 engineers, and 100 electrical engineers. Decorating and commercial art attracted many and 7 students indicated a preference for newspaper writing of various kinds. Twenty-six pupils have musical ambitions, 65 wish to be teachers, and 89 aspire to be stenographers. It is planned to have talks by representatives of the different trades for those who have expressed a preference for the trades.

New Vocational Plan in Effect at Beaver Dam, Wis. In order to avoid duplication of teaching and equipment, the board of industrial education and the board of education of Beaver Dam, Wis., have adopted a cooperative plan for the high school and vocational school. The new plan which goes into effect in September, provides for a consolidation of the shops and the addition of new shops for metal working and printing.

Under the plan two shops—one in printing and one in general metal work—will be under the supervision of a shop instructor and will be available to both the high-school and vocational-school pupils. The two woodworking and drafting shops will be consolidated into one each in the high school, these shops to be under the supervision of trained instructors and available to both schools.

The homemaking work of the part-time girls will be continued under the direction of an experienced instructor. Agriculture and commerce courses will be available to both high-school and part-time pupils. New courses in the arts and crafts, as well as home mechanics, in connection with metal working and printing, are planned.

Pay Increases Hold Vocational Teachers in the South. A gradual increase in the tenure of vocational-agricultural teachers in the southern states has been noted in the last two years, according to a report of Mr. R. D. Maltby, southern regional agent for the Federal Board for Vocational Education. Mr. Maltby estimates the increase at three per cent and attributes it to closer supervision and more favorable salary figures.

In ten of the southern states during the year 1925-26, 15.3 per cent of the agricultural teachers received a salary of $1,800 or less. During the same year, 20.5 per cent of the teachers received a salary of from $1,800 up to and including $2,000, 17.6 per cent from $2,000 up to and including $2,200, 27.4 per cent from $2,200 to $2,400, inclusive, 17.6 per cent from $2,400 to and including $3,000. The most popular salary is $2,400, 25 per cent of all the teachers in the ten states receiving this salary. The lowest salary reported was $1,500, with three men receiving this salary. The highest was $3,800, with one man in Florida receiving that salary.

School Board Plans Erection of Printing School. The school board of Indianapolis, Ind., has proposed the erection of a suitable building to house the printing school maintained by the

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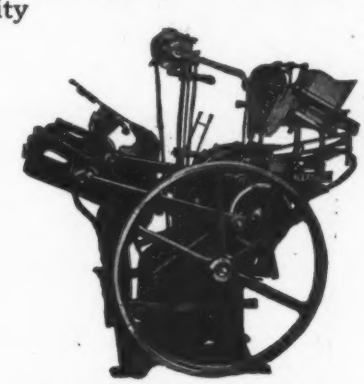
increased speed and greater efficiency, as well as day-in-and-day-out dependability



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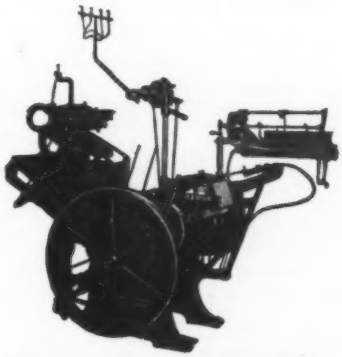
every printer needs the reliable service and capable assistance of a

KLUGE AUTOMATIC JOB PRESS FEEDER

Write for further particulars of this marvelous machine—or see it in operation at our nearest branch.



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Six Day Classes
Two Night Classes

The Only Table
That Will Do the Job

Recently one of the new High Schools in one of America's greatest cities were in need of a Drawing Table that would accommodate six day classes and two night classes. They found this Kewaunee No. 205 was the only table available that would satisfactorily serve their purpose.

This Table provides private compartments for the equipment of eight students. As will be observed by the illustration, three perpendicular lockers open in the front, while three similar ones open in the rear. Each compartment will hold a 22 x 28 drawing board, a large set of instruments, scale, triangles, ink, detailed paper, etc., with a slot for a 24-inch T square. It puts everything of the student under individual lock and key except text books. Locks may be our standard master-keyed cabinet, or padlocks if desired.

These Tables are being installed in many schools to take the place of old drawing tables and wall cases. They eliminate confusion and increase efficiency.

This Table will meet all the requirements of the average high school or university.

We are manufacturers of a very complete line of Art and Mechanical Drawing Tables. Write for our complete Book of Illustrations.

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LABORATORY FURNITURE EXPERTS

Designers and Manufacturers of Art and Mechanical Drawing Room Furniture for Schools and Colleges

KEWAUNEE-ECONOMY PLANT No. 2
ADRIAN, MICH.

Kewaunee

United Typothetae of America. The action was taken to forestall the removal of the school to Carnegie Institute at Pittsburgh, which had been threatened by its officers.

High-School Boys Complete Chicken House. The high-school class in vocational agriculture in the high school, Lawrence, Kansas, has completed a chicken house. The house is 20 x 40 ft., and is built in the Missouri style. The boys did all the work, with the exception of the laying of the concrete foundation. The work was done under the direction of Mr. G. T. Humphreys, director of shop-work in the manual-training department.

Industrial Apprentices Enrolled in Technical Schools. Industrial apprentices to the number of 2,500 were enrolled in the academic and technical classes of Chicago schools. Many trades were represented and the work is being supported by the trade-unions and employers. Certain standards as to attendance, application, and achievement must be maintained.

Ranken School Plumbing Shop Has Exhibit. The Ranken School of Mechanical Trades of St. Louis, Missouri, held an exhibit of its work at the convention of the National Association of Master Plumbers in Minneapolis. The exhibit comprised work in jointing, lead bending and burning, plumbing plans and sketches, and photographs of shop equipment and work; also photographs of general views about the school. The representatives of the Ranken School at the convention were able to bring back information concerning the trend of the plumbing industry, the advancement in plumbing materials and fixtures, and also some facts about what other trade schools have been doing.

Mr. Forest E. Moore, for the last six years head of the high-school department of agriculture at Owatonna, Minn., has accepted a position as director of vocational education for the Iowa state board of education.

ANNOUNCE MODEL-YACHT RACING ASSOCIATION

Teachers and students of shop classes, who are interested in the building and sailing of model yachts, will be pleased to learn of a model-yacht racing association which has been located for some time at Brooklyn, New York. The association was organized four years ago and is now headed by Mr. John Black, director of the industrial-arts department at Watertown, Mass.

BOSTONIA II—A MODEL OWNED BY A MEMBER OF THE BOSTON CLUB.

The association has grown slowly and at the present time has ten affiliated clubs. The membership dues are $10 and the officers of the organization are anxious to enlarge the membership by including all model-yacht clubs in the various schools of the country. A junior membership will be provided at a much lower cost to young members if warranted.

The association has enjoyed an international reputation among yacht-racing organizations. For the past two years the association has challenged England for the "Yachting-Monthly Trophy," which is emblematical of the world's championship. Last year the American challenger finished the race a close second, defeating model-yacht racers of France and Denmark.

This year a challenge has been sent and 25 model yachts have been built for the honor of representing the United States in the international event. Germany, Sweden, and France have also challenged for 1927. Elimination races have been held and Bostonia II has been selected to represent the United States at Gosport, England, in July and August.

Mr. Wellington Rindge, secretary, 1717 Beacon St., Waban, Mass., will be glad to receive inquiries from those interested in model-yacht racing.

SHOP OBJECTIVES IN THE CLASSROOM

Mr. Morris McCann, instructor in manual arts in the Test Junior High School, Richmond, Ind., has worked out a list of shop objectives for the use of the teacher of manual-arts work. Mr. McCann lists 25 accomplishments which the pupils in the woodworking shop of the junior high school should be able to master. These are as follows:

1. The necessity of making a working drawing and planning all construction work.
2. The value of tools and how to take care of them.
3. The importance of being economical and of observing all shop rules and regulations.
4. Saws—
   - A. The ripsaw is used to cut with the grain of the wood; the teeth are somewhat like chisels and possess "set" to give clearance.
   - B. The crosscut saw cuts across the grain of the wood and acts like a series of knives operated in pairs. The crosscut saw has more teeth per inch than the ripsaw and is filed in a different manner.
   - C. The backsaw is used for close, fine benchwork, is very short and has a stiff blade.
   - D. The miter saw is a large backsaw used in a miter box which is adjustable and can cut any angle from 45 to 90 degrees.
   - E. The compass or keyhole saw has a blade which tapers to almost a point and is used for sawing small openings and inside curves.
   - F. Turning and coping saws are used for sawing along irregular or curved lines. The blades are removable and should be kept taut while in use. The cutting should be done when the saw is pulled rather than pushed and the teeth should point toward the handle.
5. Planes—
   - A. The four planes according to size are the block, smooth, jack, and jointer plane. The block plane is used on small work. The smooth plane is used to finish or smooth up a small board or certain places on a large board. The jack plane is most commonly used for school use and is about 14 inches long. The jointer plane is used for very large work and is adapted to squaring up edges for joints.
   - B. A plane should be laid on its side when not in use.
   - C. The plane iron should be set about $\frac{1}{16}$" for medium work.
   - D. It is necessary to keep plane iron sharp to do good work.
6. A framing square and try-square is used for squaring lines, and surfaces and should be held firmly.
7. The marking gauge is used mainly for marking out certain widths and thicknesses.
8. A screw driver should not be allowed to slip out of the screw slot.
9. Holes should be drilled for screws before assembling.
10. A countersink is used to ream out a conical-shaped hole to allow flat-headed screws to fit flush with the surface of the wood.
11. A nail set is used to set brads or nails below the surface of the wood.
12. Brads are used to hold pieces of wood together when the surfaces are carefully finished. Nails are used when greater strength is required and screws are used for better appearance and strength.
13. A spoke shave is used for cutting concave and convex surfaces.
14. The numbers on auger bits indicate their diameter in sixteenths of an inch. The numbers on drills and gimlet bits indicate the diameter in thirty-seconds of an inch.
15. Sandpaper should be mounted on a small, flat block for sanding flat surfaces. Always sandpaper with the grain.
16. Different kinds of wood vary in color, weight, strength, texture, hardness, grain, and tendency to warp.
17. Lumber shrinks when dry and expands when wet. Lumber warps when dry due to unequal contraction on the two sides.
18. A tree grows by adding a layer of new wood each year around the trunk, just under the bark. The part which grows in the spring is softer and more porous than that which grows in the summer. The age of a tree when it is cut down is determined by counting annular rings.
19. Sapwood is the new growth through which the sap flows. Heartwood forms the inner part of the tree and gives it strength and rigidity.
20. Paint is used to preserve and beautify. Stain brings out the grain and color of the wood. It should be applied with a brush and wiped off with a rag. Paste filler fills the pores and produces a smooth, even finish. It is used on the open-grain wood and is optional on close-grained wood. Filler is thinned with benzine or turpentine to the consistency of cream and is applied in a circular motion with a brush. After it begins to dry and "frost" it is rubbed off with a rag.
21. Varnish is used to finish wood by bringing out the color and adding to the beauty. It must be applied evenly and 24 hours allowed between coats.
22. Shellac dries quickly and must be carefully applied. White shellac is caused by bleaching and the orange shellac is a natural color. Shellac and varnish should be sanded between coats.
23. Polishing wax should be used sparingly and rubbed vigorously with cheesecloth.
24. Logging is the method used in felling trees and transporting them to the mill to be cut into lumber. It is an interesting study.
25. The use of lumber creates many different occupations which may be listed under these general heads: Lumbering, saw mills, cabinetmaking, furniture making, patternmaking, manufacture of crates and boxes, sash and door manufacturing, wood finishing, carpentry, and occupations using wood and other materials.

Mr. McCann also offers another list of varied accomplishments which boys in the practical-arts classes of the seventh, eighth, and ninth grades should be required to perform. These are as follows:

1. How to hold a rule while measuring.
2. How to read a rule (not ruler).
3. How to add and subtract fractions of an inch.
4. That sandpaper is graded numerically, the average being No. 1.
5. The correct method of tearing sandpaper.
6. That a block should be used when sanding flat unfinished surfaces.
7. That sandpaper should be torn into rectangular pieces to fit block.
8. That a sandpaper block should always be of soft wood.
9. That no sanding should be done until all toolwork is done.
10. That worn sandpaper becomes useful later.
11. To call a bit by name and size.
12. That a bit is not a bore; that a bit is not a drill.
13. That a figure "9" on a bit means $\frac{9}{16}$; not No. 9.
14. That a brace is not an "auger" or "borer."
15. That direction should not be reversed when drawing out bit.
16. That a properly filed bit needs little pressure.
17. That holes are generally measured from center to center.
18. That the use of a file should be avoided whenever possible.
19. That a file when used cuts only one way.
20. That grinding without water heats to a blue and destroys the temper.

Walnut never broke a boy's heart

AN eager boy, his first real job of cabinet work nearing completion—he hurries on, proud of his work—then—c-r-a-c-k, a panel splits. And the boy is heart-broken.

You've seen them happen—these minor tragedies of the manual training room, these discouragements that come from the use of poor woods.

Boys deserve the best in woods. Give them good American Walnut to work with.

They'll take greater pride in working with its beautiful grain. They'll do better work in building with a wood they know won't warp or crack in work, that will endure in the finished piece permanently beautiful and steadfast.

Keep a stock of genuine American Walnut on hand—and send for our book on "The Story of American Walnut." It contains much information that will be of assistance in your class room work.

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TECHNIQUES

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The etching effect is created in an interesting and novel manner. The line drawing is made first with Higgins' General Drawing Ink and allowed to dry thoroughly. Then the light film of wash—a mixture of Higgins' General Drawing Ink and water—is carefully applied, moist—*never wet*. This limited moisture causes the underlying line work to "spread" to an infinitesimal degree, the sharp lines changing their aspect to one of softness, depth and shadow. An accurate approximation of an actual etching is the result. A brief reference to an original etching before the copy is started is often beneficial.

"Techniques," a new and informative leaflet which will shortly be off the press, presents a number of interesting treatments to which Higgins' Standard American Drawing Inks lend themselves. Write for it.

Higgins' General Drawing Ink is obtainable everywhere.

CHAS. M. HIGGINS & CO.
271 Ninth Street Brooklyn, N. Y.

HIGGINS'
General
Drawing Ink

21. That "sharpen" does not mean "grind."
22. Never use center of oilstone or grindstone for narrow tools.
23. That flat side of plane, bit or chisel should never be ground.
24. That flat side of plane, bit or chisel should never be raised when whetting.
25. To lay the plane on its side to avoid dulling bit or cutting bench.
26. That the cap iron, for benchwork, should be set about $\frac{1}{16}$" from the edge.
27. *That good work is impossible with dull tools.*
28. How to start a saw without jumping the line.
29. How a ripsaw differs from a crosscut saw.
30. That the number on a saw indicates number of points to the inch.
31. That a ripsaw is not always numbered 8, or a crosscut saw, 10.
32. That the backsaw is reserved for close work.
33. That it is necessary to have a line squared across two adjacent faces to cut off square.
34. That no time or labor is saved sawing around the piece.
35. That it is never necessary to chisel toward any part of the body.
36. That a large chisel will do better work than a small one.
37. That chiseling across the grain is possible and correct in many cases.
38. To watch the chisel edge and not the handle when using the mallet.
39. That the mallet or hammer should be held one third the handle length from the end.
40. That a bevel should not be called a "bevel square."
41. That gauge and square are useless if not used properly.
42. That they should be held firmly against the work when testing or gauging.
43. That the gauge point should be filed like a knife-edge and should actually cut a line.
44. That the gauge point should not project more than $\frac{1}{16}$".
45. That we gauge away from us whenever possible.
46. That the gauge should be tilted slightly in the direction of motion.
47. That the screw driver should never be sharpened like a wedge or to a sharp edge.
48. How to determine the size of nails and screws.
49. That "12d" means 12-penny and is about $3\frac{1}{2}$" long.
50. That screws have a gauge diameter as well as length.
51. That screws should never be driven without first boring through.
52. That the size of the bit is determined by the size of the screw (top piece).
53. That stone-nailing means that a nailset is not a punch.
54. That a hand screw is not a clamp.
55. That a vise will hold work without placing the entire weight on the handle.
56. That LePage's glue is only one kind of glue.
57. That "the more glue the stronger" is a mistaken idea.
58. That a loose joint is worse than none.
59. That a thick glue is worse than none.
60. That shellac does not dry in half an hour; it merely sets.
61. That shellac must be thin and applied quickly.
62. That the work must not be handled the same day if possible to avoid it.
63. That "sawdust and glue" is a poor workman's motto.
64. That wood filler is not intended to fill bad joints and ruts on the surface.
65. That a workman seldom uses a wood rasp. That a wood rasp is not a file.
66. That paint brushes must be cleaned after using and materials put away.
67. That you must not talk to the person using the circular saw, jointer, lathe, or band saw while it is in operation.
68. That all tools and machinery must be used carefully and treated with respect.
69. That a drawing should be made of the project with all dimensions before cutting out lumber.
70. That the shop is not a playhouse and that all work should be done in a businesslike way.
71. That we should always speak in shop terms and that every object has a name.

PERSONAL NEWS

Mr. Millard C. Kent, formerly of Dunwoody Industrial Institute, Minneapolis, Minn., has been appointed principal of the Boys' Vocational School at Baltimore, Md. Mr. Kent will have charge of the plans for the development and enlargement of this school, as well as the extension of the courses offered. The new program includes plans for a larger and more adequate building.

Miss Mildred A. Bowers, formerly of the continuation school at Springfield, Ohio, has been appointed principal of the Girls' Vocational School at Baltimore, Md. This school, which begins its third year in September, has an enrollment of 200 girls on a full-time basis.

Mr. Claude M. Henry, of Redfield, S. Dak., has been appointed a member of the Federal Board of Vocational Education. Mr. Henry succeeds Calvin F. McIntosh, of Indiana, who resigned.

Mr. A. M. Bleyer has been reappointed as director of vocational education at Oshkosh, Wis.

Mr. K. K. Kircher, manual-training instructor at the high school, Las Vegas, N. Mex., has resigned from the position.

Mr. A. R. Mitchell, director of the vocational school at Beaver Dam, Wis., will leave his position at the close of the school year.

Mr. E. O. Cook has been appointed superintendent of the industrial training school at St. Anthony, Idaho.

Carroll C. Goodwin will head the manual-training department of the Coney High School at Augusta, Maine.

Touch Wood. A Tale of the Trees and Their Uses. Paper, 62 pages. Issued by the American Lumberman, Chicago, Ill. The booklet offers a brief story of lumber, tells how lumber is made, and how trees are used. It shows the variety of uses for lumber in the making of furniture, baskets, barrels, and boxes, buildings, toys, railroad cars, musical instruments, airplanes, telegraph poles, bird bungalows, shingles, and wooden-handled tools.